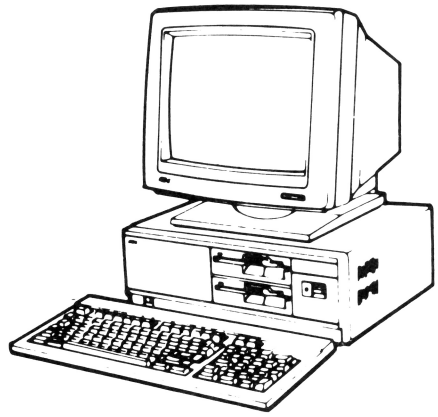


APC III



APC III Supplement to MSTM-DOS User's Guide

NEC

NEC Information Systems, Inc.

819-150188-000 Rev. 00

10-84

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Contents

	Page
Preface	v
 Chapter One Introduction	
Release Bulletin	S1-1
 Chapter Two MS-DOS Operating System	
What is an Operating System	S2-1
What is MS-DOS?	S2-1
MS-DOS System Files	S2-2
How MS-DOS Manages System Resources	S2-3
Automatic Reloading of the Command Processor	S2-4
Memory	S2-4
Diskette Drives	S2-5
Hard Disk Drives	S2-5
The Printer	S2-5
The APC III Screen	S2-6
How to Load MS-DOS on the APC III	S2-6
Making a Backup Copy of the MS-DOS System Diskette	S2-8
Formatting Diskettes	S2-8
Copying Diskettes	S2-9
Setting Up the Hard Disk	S2-10
Overview	S2-11
Disk Drive Designators	S2-11
Partition Summary	S2-12
Disk Preparation Summary	S2-13
Initializing the Hard Disk (HDSETUP Format Operation)	S2-14

Contents (cont'd)

Partitioning the Hard Disk (HDSETUP Create Option)	S2-17
Using Create to Define a Single MS-DOS Partition	S2-17
Using Create to Define Several MS-DOS Partitions	S2-19
Partitioning the Hard Disk for More than One Operating System	S2-22
Activating the MS-DOS Partition (HDSETUP Activate Option)	S2-26
Formatting the Partition for MS-DOS (MS-DOS FORMAT Command)	S2-27
Deleting an MS-DOS Partition (HDSETUP Delete Option)	S2-28
Selecting the Hard Disk Unit (HDSETUP Select Option)	S2-28
Booting from the Hard Disk	S2-29

Chapter Three The APC III Hardware

Microprocessor Unit (MPU)	S3-1
CRT Display Hardware	S3-2
APC III Keyboard	S3-3
Diskette Drives	S3-5
Hard Disk Drives	S3-5
RS-232C Serial Communications Interface	S3-5

Contents (cont'd)

Chapter Four APC III Custom Utilities

Command Formats	S4-2
Information Common to All MS-DOS Commands	S4-3
Information Specific to NEC APC III Custom Utilities	S4-4
BACKUP	S4-7
BOOT	S4-10
CHATT	S4-12
COLOR	S4-14
CRTDUMP	S4-15
DISKCOMP	S4-17
DISP	S4-18
HDSETUP	S4-19
KEY	S4-20
KEYCLICK	S4-24
LORES	S4-25
MOUSE	S4-26
PRINTER	S4-28
RAMDISK	S4-31
RESTORE	S4-33
RETRACT	S4-35
SETCOM	S4-36
8087	S4-40

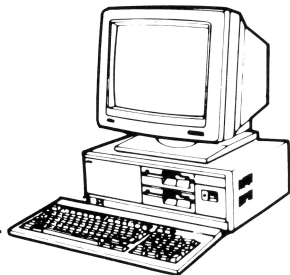
Illustrations

Figure	Title	Page
2-1	MS-DOS Loaded into Memory	S2-3
2-2	Partition Table	S2-15
2-3	Partition Table with a 1238-Track Partition	S2-18
2-4	Partition Table with a 600-Track Partition	S2-20
2-5	Partition Table Listing Three Partitions	S2-21
2-6	Partition Table Listing a 500-Track Position ...	S2-23
2-7	Partition Table Listing MS-DOS and OTHER Partitions	S2-24
2-8	Partition Table Listing Non-Contiguous PC-UX Partitions	S2-25
2-9	Partition Table Listing BOBSDOS as Active ...	S2-26
3-1	APC III Keyboard	S3-3

Tables

Table	Title	Page
2-1	Partition Summary	S2-13
2-2	Hard Disk Track Summary	S2-13

Preface



This document contains information that supplements the *MS-DOS User's Guide*. Whereas the information in the *MS-DOS User's Guide* applies to MS-DOS on any computer system, the information in this supplement is specific to MS-DOS for NEC's APC III.

For additional information about programming the NEC APC III under the MS-DOS operating system, refer to the following guides.

MS-DOS Programmer's Reference Guide

APC III Supplement to MS-DOS Programmer's Reference Guide

APC III Owner's Guide

Macro Assembler Manual

*APC III System Reference Guide**

*NEC APC III ROM BIOS listings (available on diskette)**

*NEC μ PD7220-GDC Reference Guide**

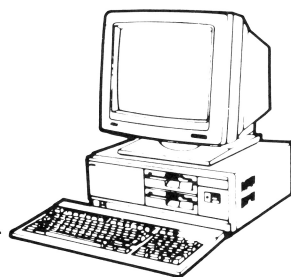
GSX-86 User's Guide

GW-Basic User's Guide.

* *Available separately*

Chapter One

Introduction



This supplement provides information necessary for you to use the MS-DOS operating system on the NEC APC III. Use it with the *MS-DOS User's Guide*. This supplement contains information on:

- formatting diskettes
- copying diskettes
- running MS-DOS utility programs
- setting up hardware.

Although you may be familiar with the MS-DOS operating system, it is suggested that you read through this supplement for commands and utilities specifically designed for the APC III personal computer. Refer to the *MS-DOS User's Guide* as needed to answer general questions.

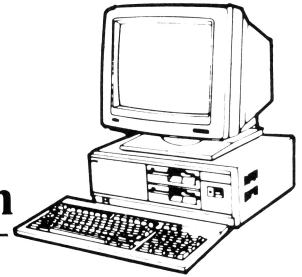
Programmers should refer to the *MS-DOS Programmer's Reference Guide* for additional information.

Release Bulletin

Read the Release Bulletin included with your MS-DOS software. It contains important information that supplements, and, at times, supersedes information found in other documents.

Chapter Two

MS-DOS Operating System



MS-DOS is an operating system, designed by Microsoft Corporation, adapted for use with NEC's APC III personal computer. This customized version of MS-DOS manages your computer system and provides functions that help you run your applications.

What is an Operating System?

If you are just beginning to use your APC III, you may not know what an operating system is. An operating system is a group of programs, or software, that controls all the components of a computer system. Operating systems can allocate memory to execute programs, and place and retrieve data on storage devices. (For the APC III, these devices are diskettes and hard disks.)

What is MS-DOS?

The MS-DOS operating system consists of three programs. You must load these programs into memory each time you use your APC III. Once loaded in memory, the MS-DOS programs begin their supervisory functions.

To run your applications or use any feature of the operating system, you enter an instruction to MS-DOS. Do this by typing a command at the keyboard. MS-DOS then performs the operations required to accomplish the task.

MS-DOS usually operates automatically. Once you give it an initial command, you do not have to issue any more instructions to complete a task.

MS-DOS System Files

MS-DOS runs by the combined operation of its three programs. These programs are as follows:

COMMAND.COM — is the command processor that interprets the commands you enter.

IO.SYS — is the program that controls all peripheral devices attached to your system. IO.SYS is active whenever you use a keyboard to type in commands, the screen to display information, or a diskette drive to store data.

MSDOS.SYS — is the heart of MS-DOS. It directs major system operations, such as placing programs to be executed into memory. MSDOS.SYS is constantly interfacing with the other two programs. It receives instructions from COMMAND.COM and user application programs requesting specific operations be performed. In response, it makes calls to the IO.SYS program to fulfill the request.

The IO.SYS and MSDOS.SYS files are contained on your system diskette. They are “hidden” files, though, and will not appear when the DIR command is used to display the names of the files on the diskette.

How MS-DOS Manages System Resources

When the MS-DOS programs are loaded, they are placed in a part of memory referred to as system memory. From here, these programs manage the resources of your computer system: memory, diskette and hard disk drives, the printer, the APC III screen, keyboard, and any auxiliary devices such as data communications lines.

Figure 2-1 represents memory after MS-DOS has been loaded.

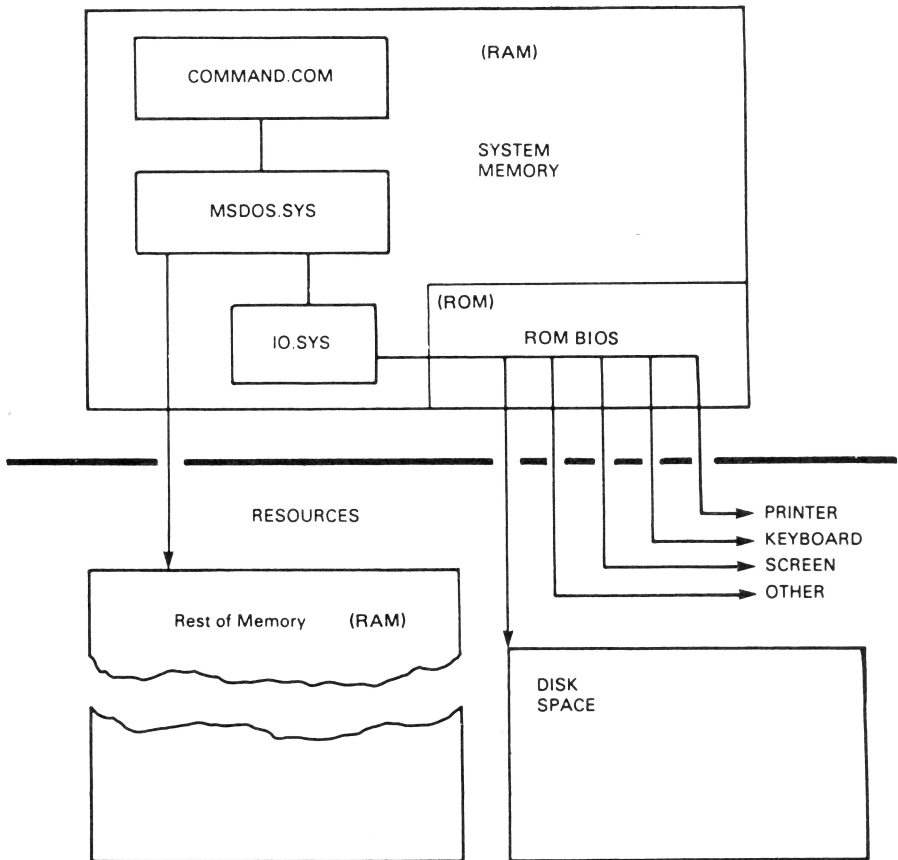


Figure 2-1 MS-DOS Loaded into Memory

The memory area not occupied by the MS-DOS programs is used to hold the applications programs, which, when executed, run under MS-DOS. The working storage areas used by these programs are also reserved here.

Automatic Reloading of the Command Processor

After the MS-DOS programs are loaded into memory, they remain there until you turn off your APC III, or until you reload your operating system. Sometimes, however, the memory requirements for executing a large program cause MS-DOS to overlay the area where the command processor resides. If this happens, MS-DOS automatically reloads the part of the command processor overlaid, as long as the diskette on which this program is stored is still in the diskette drive. If you have removed the diskette, the following message appears:

**Insert MS-DOS diskette in default drive
and strike any key when ready**

Insert the MS-DOS diskette into the diskette drive to reload the command processor. Press any key to continue.

If MS-DOS finds an incorrect version of the command processor on the diskette, this message appears:

**Invalid COMMAND.COM
Insert COMMAND.COM diskette into default drive
and strike any key when ready**

As instructed, insert the diskette with the correct version of the command processor into the default drive and press any key to continue.

Memory

MS-DOS's function in controlling memory is to allocate space for programs to execute. MS-DOS may reserve one area of memory for a program, or increase and decrease the amount of memory used by the program as it runs. As an efficiency feature, it can also swap parts of a large program that is executing in and out of memory. Programs that require a lot of memory and, thus, are swappable are distinguished by their names.

Diskette Drives

Depending on the configuration of your APC III, you have one or two diskette drives. The APC III diskette drives use 5-1/4 inch diskettes. You can store programs and data to be processed on these diskettes in files that you create.

When you create a file on diskette, MS-DOS assigns the file to a directory (a group of files). This is its “hierarchical directory structure” feature. The first directory is the root directory. It is through this that you locate all files on the diskette. In addition, you can have a number of subdirectories. You can access all of these directly or indirectly through commands to the MS-DOS operating system.

Hard Disk Drives

The APC III is available with several hard disk options, including both internal and external hard disk drives. The hard disk drives available for the APC III provide 10 megabytes of storage.

A hard disk drive is very much like a diskette. You can store programs and data on the hard disk in files that you create, and you can use the MS-DOS hierarchical directory structure to organize your files. Before using a hard disk drive, however, you need to perform several operations which are described in the section Setting Up the Hard Disk later in this chapter.

Printer

When you use your printer for output, MS-DOS directs the operation as though you were calling to use a file. That is, when you want to use the printer, direct MS-DOS to do so by entering a command with the printer’s “filename.”

This method of accessing the printer is called “device independent I/O.” It gives you greater flexibility in using devices for input and output. For example, programs designed originally for diskette file I/O can have their input come from the keyboard, or their output sent to the printer by entering the appropriate command.

The APC III Screen

Your APC III console (processor unit and keyboard) uses a monitor that allows for the display of text or graphics in either monochrome or color. The entire screen holds either 25 lines of 80 characters each (or 2000 characters) or 25 lines of 40 characters each. Like the printer, you can output to the screen by entering the screen's "filename" in a command.

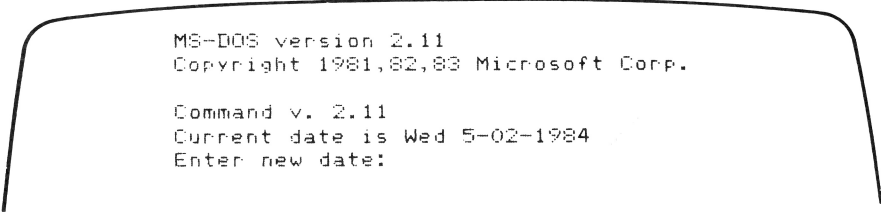
How to Load MS-DOS on the APC III

To load MS-DOS on the APC III, turn on the system by pressing the POWER button on the bottom right of the monitor, and the POWER button on the top right of the processor unit. Make sure you press the buttons until they latch. The POWER lights will come on.

When you turn the power on, the APC III automatically performs a self check. This check only takes a fraction of a second. If the check fails, you will hear a high-pitched beep. If this occurs, turn the power off by unlatching the two POWER buttons. Refer to the *APC III Owner's Guide* to verify that the system has been installed properly. If the system is installed properly and it continues to beep, call your authorized NEC dealer for assistance.

If you hear nothing, then your system is working properly. The system is waiting for you to insert the MS-DOS diskette into one of the drives.

Insert the MS-DOS diskette into drive A (the top drive). The APC III will sense that the diskette has been inserted and begin to load MS-DOS. You will hear a clicking sound as the system is being loaded. Once it is loaded, this screen appears.



```
MS-DOS version 2.11
Copyright 1981,82,83 Microsoft Corp.

Command v. 2.11
Current date is Wed 5-02-1984
Enter new date:
```

Enter the correct date, or press **RETURN** if the displayed date is correct. The format for entering the date is mm-dd-yy (month-day-year), where

mm is a one- or two-digit number from 1-12;

dd is a one- or two-digit number from 1-31;

yy is a two-digit number from 80-99, or a four-digit number from 1980-2099.

The numbers can be separated by hyphens (-) or slashes (/). For example:

4-5-84 or **04/05/84**

are both acceptable answers to the “Enter new date:” prompt.

Once you have entered a date, the system displays the prompt “Enter new time:.” Enter the correct time, or press **RETURN** to accept the time displayed. The format for entering the time is hh:mm (hour:minutes), where

hh is a one- or two-digit number from 0-23;

mm is a one- or two-digit number from 0-59.

MS-DOS uses this time to keep track of when you last updated and/or created files on the system. MS-DOS uses 24-hour time; for instance 1:30 p.m. is written 13:30.

Example:

Current time is 4:50:30:00
Enter new time: 10:44

Only use a colon (:) to separate hours and minutes. (You don’t have to enter seconds, or tenths of seconds.) If you enter an invalid time, this message appears.

Invalid time
Enter new time:

Enter the time in the correct format. Once you enter the date and time, the A> prompt appears. You are now ready to use the MS-DOS operating system.

Note If you make a mistake while typing, press the **CTRL** key and the **C** key at the same time. This Control-C function will abort the current entry. You can then type another command. To correct a line before you press < Return >, use the < Back Space > key to erase one letter at a time.

Making a Backup Copy of the MS-DOS System Diskette

Once you have entered the correct date and time, you should make a backup copy of the MS-DOS system diskette. It is strongly recommended that you make backup copies of all your diskettes. If a diskette becomes damaged, or if files are accidentally erased, you will still have all of your information on your backup copy.

This supplement describes how to make a backup copy on a two drive system. If you have a single-drive APC III, refer to Appendix A of the *MS-DOS User's Guide*.

Formatting Diskettes

You must format all diskettes before they can be used by MS-DOS. Formatting analyzes the diskette for defective areas and prepares it to accept the MS-DOS system files.

Caution Formatting a diskette destroys all existing information on a diskette. Make sure the diskette you are formatting is a new, unused diskette, or a used diskette whose contents are not needed.

Follow this procedure for formatting a diskette in drive B.

1. Refer to the previous section to display the A> prompt.
2. Enter the following at the A> prompt:

FORMAT B:

The system displays this prompt.

Insert new diskette for Drive B:
and strike any key when ready

3. Insert the diskette that you want to format into drive B, the bottom drive, and press any key.

The system displays the message “Formatting.” When the formatting is finished, the message “Format Complete” appears.

When the diskette has been formatted, this prompt appears.

Format another (Y/N)?

Type **Y** if you want to format another diskette; otherwise, type **N** to return to the **A>** prompt.

From time to time, you will want to format a diskette that is “bootable,” that is, a diskette that can load MS-DOS as well as contain program and data files. To make the diskette bootable, you must make a copy of the MS-DOS programs on it. To copy these programs from the MS-DOS diskette to another diskette, specify an option “/S” in the **FORMAT** command.

FORMAT B: /S /V

Note that the command also contains another entry -- “/V.” The /V option specifies a volume label for a diskette. Volume labels are names that identify diskettes. To display the volume label for the diskette, use the **VOL** command. (See *MS-DOS User's Guide* Chapter 5 for a description of this command.)

Copying Diskettes

Once you have formatted your diskette, you can make a copy of the MS-DOS system diskette. The **DISKCOPY** command copies the contents of one diskette onto another diskette. Use this command to duplicate your MS-DOS diskette, and any data diskette that contains your files. **DISKCOPY** is the fastest way to copy a diskette because it copies the entire diskette in one operation. Follow these steps.

1. Insert the MS-DOS system diskette into drive A, and the blank, formatted diskette into drive B.
2. Enter the following at the A> prompt:

DISKCOPY A: B:

The system displays this prompt.

Insert source diskette into Drive A:
Insert formatted target diskette into Drive B:
Press any key when ready

3. Make sure the MS-DOS diskette (source) and the blank, formatted diskette (target) are in the right drives.
4. Press any key to begin the copy procedure. The system displays this message.

Copying...

Once MS-DOS has copied the diskette, the system displays the following prompt.

Copy complete
Copy another Y/N?

Type **Y** if you want to copy another diskette. Otherwise, type **N** to return to the A> prompt.

You now have a duplicate copy of your MS-DOS diskette in drive B and the original in drive A. Save one as the backup copy of the MS-DOS diskette.

Setting Up the Hard Disk

The APC III offers several hard disk options including both internal and external hard disk drives. The APC III Custom Utility HDSETUP is a menu-driven utility that provides most of the functionality needed to prepare and maintain hard disk storage space so some or all of it is available for use under MS-DOS.

The following sections provide information needed to initialize and maintain disk storage space, including detailed examples of the use of the HDSETUP options. Read this information before using HDSETUP to ensure that hard disks are correctly initialized and set up.

Overview

This section provides a summary of information users need concerning disk drive designators, partitions, and disk preparation.

DISK DRIVE DESIGNATORS

MS-DOS refers to the diskette and hard disk drives with alphabetic characters called drive designators (d:). For a dual drive APC III, the first diskette drive is referred to as drive A: and the second as drive B:. For a single drive APC III, MS-DOS still recognizes two diskette drives even though there is only one physical diskette drive in the base unit. (If this concept is not fully understood, refer to Appendix A of the *MS-DOS User's Guide*.)

Because it is possible to have two hard disk units attached to the APC III, MS-DOS reserves the drive designations C: and D: for these disks. C: refers to the first (master) hard disk unit (unit #0) and D: refers to the second (slave) hard disk unit (unit #1).

Just as a diskette must be formatted before it can be used to store information, a hard disk must also be prepared. If a user attempts to use a hard disk before it has been prepared, the following error message will be displayed:

Bad unit error reading drive C (or D)

PARTITION SUMMARY

A hard disk may be divided into one or more sections called partitions. The maximum number of partitions is 12. These partitions, which may belong to different operating systems, can vary in size and in format. Some restrictions will apply, such as minimum partition size, but they are operating-system dependent. HDSETUP operates on MS-DOS partitions only. Partitions for other operating systems, such as PC-UX, must be allocated using setup utilities written for that operating system. Such partitions are referred to as “OTHER” partitions.

Before creating any partitions on the hard disk, evaluate how the disk will be used. For example, if the disk will be shared between two or more operating systems, an appropriate number of tracks must be left available for any non-MS-DOS partitions that are to be created. If more than one user will be storing data on the hard disk, it may be desirable to create an MS-DOS partition for each user. Because MS-DOS allows only one partition to be active at a time, a single MS-DOS user may desire to allocate the entire disk as one large MS-DOS partition.

Each 10 MB hard disk available for use with the APC III has 1240 tracks (a track is a physical area of the disk). The user defines the size of a partition by specifying the number of tracks that will be used for the partition. The first two tracks of the hard disk, track 0 and 1, are reserved for special information, including the Hard Disk Partition Table. This table contains information describing disk use such as partition names, sizes, and starting track numbers (refer to the *APC III Supplement to the MS-DOS Programmer's Reference Guide* for additional information). The remaining 1238 tracks are available to be assigned to MS-DOS partitions or left for other operating systems.

Note that the tracks are numbered relative to 0. Therefore, the disk has 1240 tracks which are numbered 0 through 1239.

Tables 2-1 and 2-2 summarize information you need to know to define partitions that will be used under MS-DOS.

Table 2-1 Partition Summary

<u>Partition Description</u>	<u>Tracks</u>
Minimum Number of Partitions per Disk:	1
Maximum Number of Partitions per Disk:	12
Minimum Partition Size for MS-DOS:	9 tracks
Maximum Partition Size for MS-DOS:	1238 tracks
If desired, PC-UX can be installed on a hard disk along with MS-DOS. PC-UX requires at least 2 of the available 12 partitions with the following approximate minimum size requirements.	
Partition RHD00:	480 tracks
Partition RHD01:	120 tracks

Table 2-2 Hard Disk Track Summary

<u>Logical Track Number</u>	<u>Physical Track Number</u>	<u>Comments</u>
0	1	Reserved
1	2	Reserved
2	3	} Available for use
3	4	
.	.	
.	.	
.	.	
1239	1240	

DISK PREPARATION SUMMARY

Just as a diskette must be formatted before it can be used to store information, a hard disk must also be prepared. The following list summarizes the procedures that must be performed to prepare a hard disk for use, create a partition, and make the partition available to MS-DOS.

1. The HDSETUP option Format must be used once to initialize the entire disk (track 0 through 1239).
2. The HDSETUP option Create must be used to specify the name, starting track, and number of tracks to be used for a partition. (All partitions defined with the Create option are MS-DOS partitions.) Create can be used as many times as desired to define partitions.
3. The HDSETUP option Activate must be used to give a partition “active” status, that is, to make it accessible to MS-DOS.
4. While a partition is active, the MS-DOS utility FORMAT must be used to format the partition.

The following sections provide detailed examples of the use of the HDSETUP options.

Initializing the Hard Disk (HDSETUP Format Option)

The first step in preparing the hard disk is to initialize it. Enter the following command to start HDSETUP, the hard disk set up utility.

HDSETUP <Return>

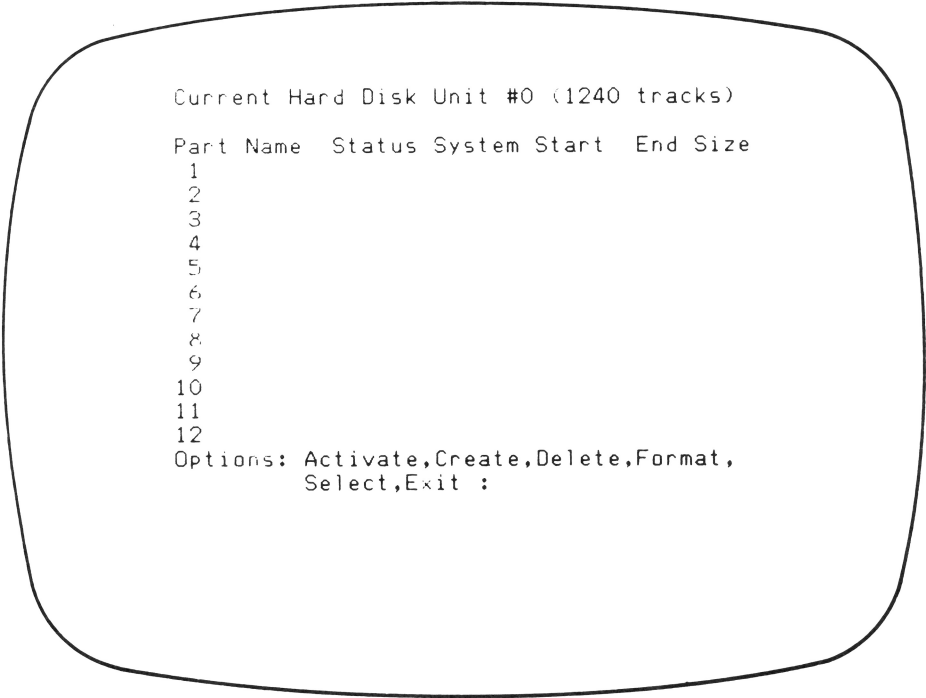
Before the hard disk has been initialized, the following message appears.

Current Hard Disk Unit #0 (1240 tracks)

The drive configuration cannot be read
A new configuration will be created

Type <space> to continue, <esc> to exit

HDSETUP always examines unit #0 first. Unit #0 is a 10 megabyte hard disk so HDSETUP has indicated that there are 1240 tracks on the disk. Since this is an uninitialized disk, there is no drive configuration. Press the space bar to continue. The screen shown in Figure 2-2 will be displayed.



```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status System Start  End Size
1
2
3
4
5
6
7
8
9
10
11
12
Options: Activate, Create, Delete, Format,
        Select, Exit :
```

Figure 2-2 Partition Table

The screen displays the partition information for the hard disk. No partition information is displayed because no partitions are yet defined.

When using HDSETUP, only the first letter of the operation must be entered to choose an operation. HDSETUP then prompts you for any additional information that is needed. If a mistake is made at any point in an operation, press the <Esc> key to terminate the operation.

The Format operation must be performed first. Type **F** and <Return>. The following message is displayed at the bottom of the partition table.

FORMAT ENTIRE DISK (Y/N) ?

The Format option of HDSETUP operates in two modes. It is possible to initialize the entire disk, including the partition configuration, or to format on a track-by-track basis. The first time that a hard disk unit is connected, the entire disk must be initialized, so type **Y** and <Return>. HDSETUP displays the following prompt.

ALL DATA AND CONFIGURATION
WILL BE DESTROYED.
ARE YOU SURE (Y/N)?

This warning informs the user that all tracks, including those allocated to OTHER operating system partitions, will be formatted and that all data, including the hard disk partition table, will be destroyed. If this is not desirable, type **N** and then < Return > to return to the options menu.

Aside from the first initialization of the hard disk unit, formatting the entire disk may be desirable if the partition configuration has been destroyed or the user wishes to reallocate all the partitions. Before doing so, be sure to back up all important files.

To continue the example, type **Y** and then < Return >. The entire disk will now be formatted and a new configuration created.

The preceding example describes the initialization of the entire disk. It is possible and sometimes desirable to use the format operation on a part of the disk. HDSETUP permits formatting track-by-track so that a section of the hard disk may be formatted. Enter the starting and ending track numbers with extreme caution to be sure that tracks you wish to preserve are not formatted. After beginning the Format option as it was shown above, HDSETUP displays this prompt.

FORMAT ENTIRE DISK (Y/N) ?

Type **N** and then < Return > to format on a track-by-track basis. Note that this mode of the Format option only initializes tracks that are unallocated or allocated to MS-DOS partitions. It will not initialize tracks allocated to OTHER operating systems. HDSETUP now displays this message.

Enter starting track number:

Enter the number of the first track to be initialized, for example **200**, and then press < Return >. HDSETUP displays the following prompt.

Enter ending track number:

Enter the number of the last track to be initialized. For this example, use 1239 (the last track on the disk). This is the total number of tracks displayed at the top of the screen minus 1, since the tracks are numbered relative to 0. Type **1239** and then < Return >. HDSETUP checks the configuration to see if these tracks are available and displays the following message.

Formatting may DESTROY data.
Are you sure (Y/N)?

This is a safety feature to prevent the accidental overwrite of information that is stored on the disk. Type **Y** and < Return > to continue. Type **N** and < Return > if a mistake has been made.

Formatting begins, and as each track is formatted, HDSETUP updates the number of remaining tracks on the screen until the operation is complete. Tracks 200 through 1239 are now initialized.

Partitioning the Hard Disk (HDSETUP Create Option)

After the hard disk has been initialized by the Format option of HDSETUP, the disk can be partitioned. The next few sections show several examples of using the HDSETUP option Create to define partitions.

Note that partition names, although optional, may consist of the same set of characters as MS-DOS filenames.

USING CREATE TO DEFINE A SINGLE MS-DOS PARTITION

In this example, the entire disk will be allocated as a single MS-DOS partition. First type **C** and < Return > to select the Create option of HDSETUP. The following prompt will be displayed.

Enter starting track number:

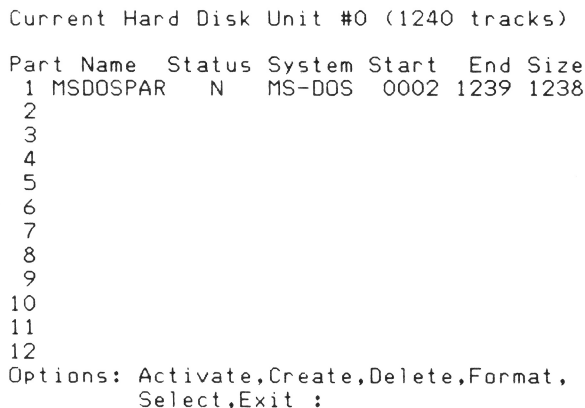
For all partitioning schemes, the first available track is track 2. The first two tracks (0 and 1) are reserved. Enter **2** and < Return >. HDSETUP displays the following prompt.

Enter partition size:

In this example the maximum size for the partition is 1238 tracks (1240 minus 2). Enter **1238** and < Return >. HDSETUP now prompts:

Enter partition name (8 char.):

Give the partition a name up to 8 characters in length. The name will be recorded in the partition table and can be useful in keeping track of what is stored in a partition. For this example, the partition will be called MSDOSPAR to indicate that it is a general purpose MS-DOS partition. Type **MSDOSPAR** and < Return >. The partition table on the screen will be updated as shown in Figure 2-3.



```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status System Start  End Size
1 MSDOSPAR   N    MS-DOS 0002 1239 1238
2
3
4
5
6
7
8
9
10
11
12
Options: Activate, Create, Delete, Format,
         Select, Exit :
```

Figure 2-3 Partition Table with a 1238-Track Partition

The MS-DOS partition has been created and may be activated. See the section on activating the MS-DOS partition.

USING CREATE TO DEFINE SEVERAL MS-DOS PARTITIONS

In this example, the disk will be allocated into three MS-DOS partitions. One will be a general purpose MS-DOS partition belonging to a user of the system. The second and third partitions will both belong to a different user who wants to keep two different projects separate from each other.

To begin, type **C** and **< Return >** to select the Create option of **HDSETUP**, which displays the following prompt.

Enter starting track number:

As in the previous example, the first available track is track 2. The first two tracks (0 and 1) are reserved. Enter **2** and **< Return >**. **HDSETUP** displays the following prompt.

Enter partition size:

In this example, the first partition will be for the user who needs 600 tracks. Enter **600** and **< Return >**. **HDSETUP** now displays the following prompt.

Enter partition name (8 char.):

Give the partition a name up to 8 characters in length. In this case, the names are important since the partitions belong to different users. This partition will be called **BOBSDOS** to indicate that it is Bob's general purpose MS-DOS partition.

Type **BOBSDOS** and **< Return >**. The partition table on the screen is updated as shown in Figure 2-4.

```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status System Start  End Size
1  BOBSDOS   N    MS-DOS  0002  0601 600
2
3
4
5
6
7
8
9
10
11
12
Options: Activate,Create,Delete,Format,
         Select,Exit :
```

Figure 2-4 Partition Table with a 600-Track Partition

The following operations will create the second and third partitions. After performing these operations, the partition table would appear as shown in Figure 2-5.

```
C < Return >
Enter starting track number: 602
Enter partition size: 300
Enter partition name (8 char.): JIMSGAME

C < Return >
Enter starting track number: 902
Enter partition size: 338
Enter partition name (8 char.): JIMSACCT
```

```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status System Start  End  Size
1 BOBSDOS   N    MS-DOS 0002 0601 600
2 JIMSGAME  N    MS-DOS 0602 0901 300
3 JIMSACCT  N    MS-DOS 0902 1238 338
4
5
6
7
8
9
10
11
12
Options: Activate,Create,Delete,Format,
        Select,Exit :
```

Figure 2-5 Partition Table Listing Three Partitions

These partitions were created in sequential order, but JIMS-ACCT could have been created before BOBSDOS. Tracks may be allocated in any order; however, they appear in track number order in the partition table, regardless of when they were created. This also applies to OTHER operating system partitions.

PARTITIONING THE HARD DISK FOR MORE THAN ONE OPERATING SYSTEM

In this example, one MS-DOS partition will be allocated. Because this user intends to share the hard disk with another operating system (PC-UX for this example), some tracks will be left available. Type **C** and < Return > to select the Create option of HDSETUP, which displays the following prompt.

Enter starting track number:

As in the first two examples, the first available track is track 2. The first two tracks (0 and 1) are reserved. In this case enter **2** and < Return >. HDSETUP displays the following prompt.

Enter partition size:

In this example the user has decided to allocate 500 tracks to an MS-DOS partition and leave the rest of the disk available. Enter **500** and < Return >. HDSETUP displays the following prompt.

Enter partition name (8 char.):

This partition will be labelled **DOSPART** to indicate that it is a general purpose MS-DOS partition. Type **DOSPART** and < Return >. The partition table on the screen will be updated as shown in Figure 2-6.

```
Current Hard Disk Unix #0 (1240 tracks)

Part Name  Status System Start  End Size
1 DOSPART   N    MS-DOS 0002  0501  500
2
3
4
5
6
7
8
9
10
11
12
Options: Activate,Create,Delete,Format,
        Select,Exit :
```

Figure 2-6 Partition Table Listing a 500-Track Partition

The remaining tracks on the disk could then be allocated using another operating system's partitioning utility. The partitions created with another operating system also appear in the partition table. For example, if two partitions were created for PC-UX (call them RHD00 and RHD01, two PC-UX partition labels), the partition table would appear as shown in Figure 2-7.

```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status  System  Start   End   Size
1  DOSPART   N    MS-DOS  0002   0501   500
2  RHD00     N    OTHER   0502   1101   600
3  RDH01     N    OTHER   1102   1239   138
4
5
6
7
8
9
10
11
12
Options: Activate,Create,Delete,Format,
         Select,Exit :
```

Figure 2-7 Partition Table Listing MS-DOS and OTHER Partitions

Notice that HDSETUP does not indicate what operating system the other partitions belong to. It only designates partitions as MS-DOS or OTHER. OTHER partitions may reside anywhere (any starting and ending tracks) on the disk; they do not have to be contiguous. For example, Figure 2-8 shows an alternate partitioning scheme which provides the same amount of disk space and the same end results as that shown in Figure 2-7.

```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status System Start  End Size
1 RHD00    N   MS-DOS 0002 0601 600
2 DOSPART  N   OTHER 0602 1101 500
3 RHD01    N   OTHER 1102 1239 138
4
5
6
7
8
9
10
11
12
Options: Activate,Create,Delete,Format,
         Select,Exit :
```

Figure 2-8 Partition Table Listing Non-Contiguous PC-UX Partitions

PC-UX Note

PC-UX can reside on a hard disk along with MS-DOS. The two PC-UX partitions required in the installation of PC-UX have the following approximate minimum size requirements.

RHD00: 480 tracks (4 MB)
RHD01: 120 tracks (1 MB)

These tracks may be left available in any position on the hard disk. Leaving a sufficient number of tracks unallocated avoids having to back up all files and repartition the hard disk.

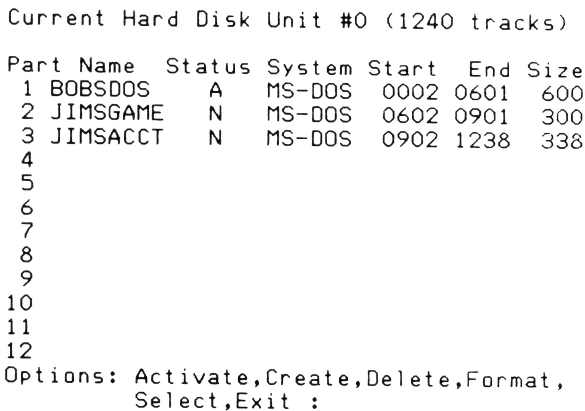
Activating the MS-DOS Partition (HDSETUP Activate Option)

Although several MS-DOS partitions may be created on a single hard disk, only one may be active at any time. This implies that if partition 1 is the active MS-DOS partition, then only the files in partition 1 are available for access. In order to gain access to files in another MS-DOS partition, HDSETUP must be used to change the active partition.

Making a partition the active MS-DOS partition is accomplished by using the Activate option. In Figure 2-4, there is only one partition that can be activated. In Figure 2-5, the two users would have to switch between partitions. Using the partitions set up in Figure 2-5, type **A** and **< Return >**. HDSETUP displays the following prompt.

Enter the number of the MS-DOS partition.

To activate the BOBSDOS partition, enter **1** and **< Return >**. The partition table is displayed as shown in Figure 2-9.



```
Current Hard Disk Unit #0 (1240 tracks)

Part Name  Status System Start  End  Size
1 BOBSDOS  A   MS-DOS 0002 0601 600
2 JIMSGAME N   MS-DOS 0602 0901 300
3 JIMSACCT N   MS-DOS 0902 1238 338
4
5
6
7
8
9
10
11
12
Options: Activate, Create, Delete, Format,
        Select, Exit :
```

Figure 2-9 Partition Table Listing BOBSDOS as Active

The “A” under Status indicates that partition 1 is the active MS-DOS partition. You could now exit HDSETUP by selecting the Exit option and use the MS-DOS FORMAT utility which is described in the next section. The Activate option of HDSETUP, like Create and Delete, applies only to MS-DOS partitions. Other operating systems will provide utilities specific to their needs.

Note that the Exit option always returns the user to the root directory of the default drive.

Formatting the Partition for MS-DOS (MS-DOS FORMAT Command)

After the hard disk has been initialized and an MS-DOS partition has been created and activated, the MS-DOS utility FORMAT must be run. This must be done in order to write information that MS-DOS expects onto a partition of the hard disk. (This operation is different from the Format option of HDSETUP which initializes the hard disk.)

FORMAT operates in the same way as it does for a diskette (see the *MS-DOS User's Guide*), except that it formats only the active partition, not the entire disk. The /S and /V options work in the same way. It is especially important to use the /S option if you wish to be able to boot from the hard disk, because it brings over the necessary system files.

In this example, the partition BOBSDOS (the activated partition in Figure 2-9) will be formatted. Because the partition resides on hard disk unit #0, MS-DOS will refer to it as drive C:. Enter the following command.

FORMAT C: /S

This formats the partition BOBSDOS and allows it to be accessed by MS-DOS. It is important to realize that only one partition has been formatted for MS-DOS. If other partitions are created and subsequently activated, they must also be formatted once before MS-DOS can access the disk. Once a partition has been formatted, it does not have to be reformatted each time it is activated.

Deleting an MS-DOS Partition (HDSETUP Delete Option)

The Delete option of HDSETUP removes only MS-DOS partitions. If an attempt to delete a partition belonging to an OTHER operating system is made, an error message is displayed. To delete a partition, run HDSETUP, enter **D** and **< Return >** to request the delete operation. HDSETUP displays the following prompt.

Enter the number of the MS-DOS partition
you want to delete:

Type the partition number as shown in the table and **< Return >**. HDSETUP displays the following warning prompt.

All data in the MS-DOS partition will be
DESTROYED. Are you sure (Y/N)?

Type **Y** to continue the delete process. The deleted partition is removed from the partition table and the tracks that it occupied become available.

Note that partitions are listed in sequential track order, and partition numbers change as partitions are created and deleted.

Selecting the Hard Disk Unit (HDSETUP Select Option)

The Select option of HDSETUP provides a way to choose between hard disk units #0 and #1. HDSETUP always defaults to unit #0 and unit #1 must be selected in order to access it. Type an **S** and **< Return >** to start the Select operation. HDSETUP displays the following prompt.

Enter the unit number (0/1):

Enter the unit number desired. The partition table for the selected unit is displayed.

All previous operations and examples apply to hard disk unit #1 exactly as described for unit #0. Once unit #1 has been selected, proceed as described in the previous sections. When running the MS-DOS FORMAT or other commands, use drive designator **D:** for hard disk unit #1.

Booting from the Hard Disk

One of the features of the APC III is the ability to boot MS-DOS from hard disk. The first requirement is that an active MS-DOS partition be formatted with the /S option of the MS-DOS FORMAT command. Note that the /S option copies IO.SYS, MSDOS.SYS, and COMMAND.COM to the destination volume. APC III users must also copy ANSI.SYS, CONFIG.SYS, and any other installable drivers or utilities to the hard disk volume. The next step is to designate the volume as the boot volume. This is accomplished in one of two ways.

The first method is to select the boot drive with the BOOT utility described in Chapter 4. The second method, which only applies to hard disk unit #0, is to use a function key as described in the following paragraph.

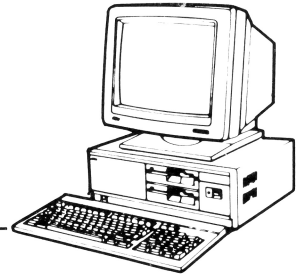
At power on or reset, hold down the function key corresponding to the number of the active bootable partition in the HDSETUP partition table. For example, if the third partition of unit #0 (drive C:) is the active MS-DOS bootable partition, hold down PF3 while pressing RESET or POWER. Continue to hold PF3 until the disk access lights indicate that the system is booting.

Should you decide to boot from floppy drive A:, power-on or reset while holding down < Fnc >. If the BOOT utility has been used to select drive D:, then BOOT must be used again in order to redefine the system boot drive.

Additional technical information regarding the partitioning and operation of the APC III hard disks can be found in the *APC III Supplement to the MS-DOS Programmer's Reference Guide*.

Chapter Three

The APC III Hardware



This chapter provides a brief overview of the NEC APC III hardware relevant to the MS-DOS operating system. For more detailed descriptions, see the *APC III Supplement to MS-DOS Programmer's Reference Guide*, and the *APC III System Reference Guide*.

Microprocessor Unit (MPU)

The APC III uses an 8086 processor that operates with a clock speed of 8 MHz. The standard configuration includes 128 KB of read/write semiconductor RAM memory, and 32 KB of read only memory (ROM). The ROM contains a program called the Basic Input/Output System (BIOS), a self check routine, and a ROM loader, which is used in the system bootstrap process when an operating system is loaded from diskette.

You can add additional semiconductor memory in increments of 128 KB, up to a total of 640 KB. Memory is added via circuit cards that plug into the APC III expansion bus. Each expansion bus can hold up to 256 KB of expansion memory. Two cards are required for maximum user memory configuration.

CRT Display Hardware

The standard APC III system provides both text and graphics display capabilities. You have the option of choosing between a CRT monitor (monochrome or color), or a TV display. If you select a TV display, you will need an RF adapter. Before you use the APC III, set the dip switch to indicate the type of monitor you have. Please refer to *APC III Owner's Guide* for details on setting this switch.

The text display offers an 80-character x 25 line display (CRT displays only) or a 40-character x 25 line display (CRT or TV display).

It is possible for a nonstandard (low resolution) CRT monitor to support an 80 x 25 character screen display. Since dip switch 1-10 must be in the low resolution position to support these monitors, a 40 x 25 character text mode will be selected at boot time. The LORES (low resolution) utility has been provided for users who want to use this feature of their monitors.

This utility resets the screen display to an 80 x 25 character mode. Further information on the LORES utility can be found in the Custom Utilities section of this supplement.

Characters can be displayed in various combinations, such as color, reverse video, blinking characters, or underline characters.

In the text modes, two complete display pages are provided, which are switchable under software control. MS-DOS selects the most appropriate mode by default for the monitor type (CRT or TV) being used. The display data is held in an 8 KB video RAM (VRAM), accessible to the MPU via the main system data and address buses. The display hardware uses an NEC 7220 graphics display controller (GDC) to generate the video signals.

The graphics display, controlled by its own dedicated 7220 GDC, offers several monochrome graphics modes on the standard APC III system. The APC III can support color graphics by adding the color graphics option.

The standard APC III is equipped with 64 KB of graphics display memory, and the supported modes include the following:

- 320 x 200 pixel monochrome (TV or CRT monitor display)
- 640 x 200 pixel monochrome (CRT monitor displays only)
- 640 x 400 pixel monochrome (CRT monitor displays only).

The color graphics option adds 128 KB of graphics display memory. This option allows the addition of color to each of the above listed modes. (A color CRT monitor or TV is required.)

The hardware permits concurrent display of a text mode and graphics mode. MS-DOS itself does not use the graphics displays, but they are necessary for certain user applications programs, utilities, and the graphics subsystem (GSX) included with the MS-DOS diskette set.

APC III Keyboard

The standard APC III system is equipped with a detachable keyboard featuring 101 keys. The bottom of the keyboard has adjustable feet, allowing you a choice of two keyboard angles. Figure 3-1 is an illustration of the APC III keyboard.

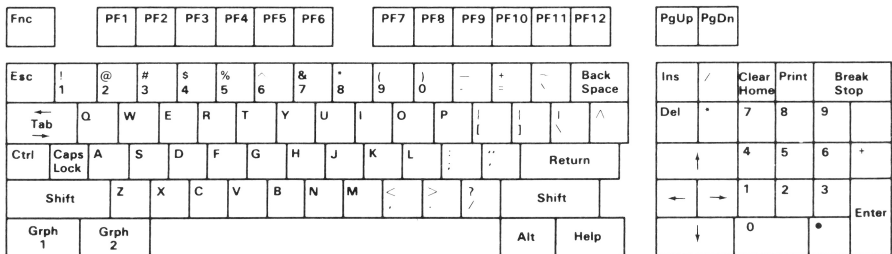


Figure 3-1 APC III Keyboard

In MS-DOS certain keys have special functions.

< Back Space > moves the cursor back one character at a time. At the same time, it erases any old characters. Use this key to correct typing errors before you press < Return >.

< Del > deletes the entire command line being entered. A “/” is displayed at the end of the deleted line. The cursor returns to the first column of the next line of the display.

< Break Stop > temporarily stops the transfer of characters to the display. Use this to stop, or slow down, data that is scrolling on the screen. Press < Break Stop > again to continue data output.

< Return > enters the command to MS-DOS.

At times, the keys on the keyboard and keypad can be used in combinations to perform unique functions. Press the keys simultaneously to perform these functions.

< Ctrl > + < Print > causes the system printer to print (echo) all characters written to the display. This is useful in recording MS-DOS/user dialogue. Press < Ctrl > + < Print > again to stop echo.

< Fnc > + < Ctrl > + < Break Stop > pressed in the order indicated causes the MS-DOS system to be reloaded from diskette. Use this to exit from infinite loops, or from situations where the system has been corrupted. (This is called a warm boot.)

< Shift > + < Print > causes the system to print out what is displayed on the screen (text data only).

< Shift > + < Ctrl > + < Print > pressed in the order indicated causes a copy of the graphics data displayed on the screen to be printed. (Note that the CRTDUMP command must be used to load the CRTDUMP resident extension before you request a graphics dump. See the section on Custom Utilities for further information on CRTDUMP.)

Twelve programmable function keys are provided, each of which can be used with one of the four shift keys. This gives you a total of 60 unique function key/shift combinations.

The APC III uses the unshifted function keys 1 through 9 as MS-DOS command line template editing keys. The APC III KEY utility can be used to program additional function keys. A slot for function key templates is provided above the function keys. In addition, there is a storage area for unused templates underneath the keyboard.

Refer to the *MS-DOS Programmer's Reference Guide* (and its supplement), and the *APC III System Reference Guide* for further information on the APC III keyboard.

Diskette Drives

The APC III uses one or two 5-1/4 inch diskette drives. Each drive has a 360 KB capacity.

Some software packages are distributed on 160 KB formatted diskettes. These diskettes can be read and written by a 360 KB drive.

Hard Disk Drives

The APC III can also include one or two 5¼ inch hard disks. Each hard disk has a 10 MB capacity.

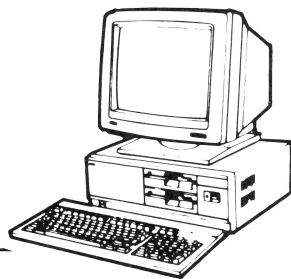
RS-232C Serial Communications Interface

The standard NEC APC III system is equipped with an RS-232C-compatible serial communications port. It can be programmed, under software control, for baud rates from 75 to 9600; 1, 1.5, or 2 stop bits, even, odd, or no parity; and from 5 to 8 data bits. The port, recognized by MS-DOS as the device named AUX, can be used to connect the APC III to a variety of modems, peripherals, or other computers. You can use the SETCOM utility to configure the port parameters under MS-DOS. See the section on Custom Utilities for further information on SETCOM.

As an option, the APC III can be equipped with two additional RS-232C-compatible serial communication ports. These ports, referred to by the device names AUX2 and AUX3 respectively, can be used for the same purposes as the standard serial port (AUX) and are also configured by SETCOM.

Chapter Four

APC III Custom Utilities



The following utilities have been written by NECIS for the APC III under MS-DOS.

BACKUP Writes backup copies of files from a hard disk to diskette.

BOOT Designates a diskette drive or hard disk volume as the system boot drive.

CHATT Changes and displays the file attributes.

COLOR Sets the default screen color to white or green (color TV or monitor), or sets grey-tone intensity (b/w TV or monitor).

CRTDUMP Dumps the contents of the APC III screen to the printer.

DISKCOMP Compares the contents of two diskettes.

DISP Displays the APC III displayable character set on the screen.

HDSETUP Initializes and partitions a hard disk.

KEY Allows reprogramming of the APC III keyboard, including function keys.

KEYCLICK Turns the keyclick tone on or off.

LORES Sets 80 x 25 character mode for a low-resolution CRT monitor.

MOUSE Configures the GSX device driver to accept input from a mouse.

PRINTER	Specifies the type of printer to be used as the default PRN device.
RAMDISK	Turns the ramdisk option on or off, and sets the size of the ramdisk.
RESTORE	Restores files from BACKUP diskettes to a hard disk.
RETRACT	Retracts the access arm of the hard disk unit to a safe landing area to protect data and equipment.
SETCOM	Sets the operating parameters for the standard and optional serial ports.
8087	Indicates the presence or absence of an 8087-2 processor.

For additional information about using these utilities, refer to the *APC III Supplement to MS-DOS Programmer's Reference Guide*.

Command Formats

The following notation indicates how you should format MS-DOS commands.

1. You must enter any words shown in capital letters. These words are called keywords and must be entered exactly as shown. You can enter these keywords in any combination of uppercase and lowercase letters; MS-DOS will convert all keywords to uppercase.
2. You supply the text for any words shown in angle brackets (<>). For example, you should enter the name of your file when <filename> is shown in the format.
3. Items in square brackets ([]) are optional. If you want to include the optional information, do not include the square brackets, only the information within the brackets.
4. An ellipsis (...) indicates that you may repeat an item as many times as you like.

5. A vertical bar (|) separates sets of parameters that you may use with a command.
6. You must include all punctuation and symbols where shown (except square brackets), such as commas, equal signs, question marks, colons, or slashes.

Information Common to All MS-DOS Commands

The following information applies to all MS-DOS commands:

1. Commands are usually followed by one or more options.
2. Commands and options may be entered in uppercase or lowercase, or a combination of keys.
3. Commands and options must be separated by delimiters. Because they are easiest, you will usually use the space and comma as index delimiters. For example:

DEL MYFILE.OLD NEWFILE.TXT
RENAME, THISFILE THATFILE

You can also use the semicolon (;), the equal sign (=), or the tab key as delimiters in MS-DOS commands.

4. Do not separate a file specification with delimiters, since the colon and the period already serve as delimiters.
5. When instructions say “Press any key,” you can press any alpha (A-Z) or numeric (0-9) key.
6. You must include the filename extension when referring to a file that already has a filename extension.
7. You can abort commands when they are running by pressing < Ctrl > + < C >.
8. Commands take effect only after you have pressed < Return >.
9. Wild cards (global filename characters) and device names (for example, PRN or CON) are not allowed in the names of any commands.

10. When commands produce a large amount of output on the screen, the display will automatically scroll to the next screen. You can press < Ctrl > + < S > to suspend the display. Press any key to resume the display.
11. MS-DOS editing and function keys can be used when entering commands. Refer to Chapter 6 of the *MS-DOS User's Guide* for a complete description of these keys.
12. The prompt from the command processor is the default drive designation plus a greater-than sign; for example, A >.
13. Disk drives are referred to as source drives and target drives. A source drive is the drive you will be transferring information from. A target drive is the drive you will be transferring information to.

Information Specific to NEC APC III Custom Utilities

1. The semicolon (;) and equal sign (=) are acceptable delimiters for MS-DOS commands. Blanks are the only acceptable delimiters for the APC III Custom Utilities. Utility commands should be entered in the following format.

COMMAND parameter parameter ...

2. The APC III Custom Utilities, along with some MS-DOS commands, require that the ANSI.SYS installable device driver be present to function properly. In order to automatically install the driver, the files CONFIG.SYS (containing the entry "DEVICE = ANSI.SYS") and ANSI.SYS must be present on the boot unit. Bootable system diskettes created by the FORMAT /S command will not contain these files; you can use the COPY command to bring CONFIG.SYS and ANSI.SYS over to new system diskettes.

3. Some APC III Custom Utilities allow users to configure various system parameters; the utilities store the user selected parameters in non-volatile (battery-backed) memory. When the system is booted, the position of switch 5 on the rear of the APC III base unit tells the system whether to use the parameters stored in non-volatile memory or to use the set of default parameters and also set these values into non-volatile memory. Switch 5 can be set as follows:

UP	Use the system default parameters to set system configuration and write these parameters into non-volatile memory. (This is the factory setting of the switch.)
DOWN	Use the parameters stored in non-volatile memory.

The first time you use the APC III (after unpacking it), the system should be booted with switch 5 in the UP position; this ensures that valid system parameters are stored in non-volatile memory. For subsequent operation, set the switch to the DOWN position so that any system parameters you set with the Custom Utilities are stored in non-volatile memory. For subsequent operation, set the switch to the DOWN position so that any system parameters you set with the Custom Utilities are stored in non-volatile memory.

4. The COLOR utility can be used to set the screen color to green; however, when a monochrome graphic display mode (mode 5, 6, or 8) is in use, secret (black) text is output to the screen.
5. Displaying an APC III Custom Utility help screen (the "?" option) while a graphic display mode is selected causes the display to remain on the screen after pressing a key to continue. This happens because the help displays are written directly to the text VRAM. To avoid this condition, select a text display mode before using the utility.

6. The Custom Utilities allow users to abbreviate various command line parameters when entering commands. Extreme care should be taken when abbreviating a parameter to make sure it is distinct enough to avoid confusion with some other parameter. For example, the command "SETCOM 7" could be specifying "75 baud" or "7 data bits." It would be less ambiguous to use 75 to indicate the baud rate and 7d to indicate the data bits.
7. Section 3.3 of the *MS-DOS User's Guide* lists several illegal filenames that cannot be used under MS-DOS. The following filenames are also illegal for use with the APC III.
 - AUX2
 - AUX3
 - CLOCK
 - GRAPH

Name	Type
BACKUP	External

Purpose

Writes backup copies of files existing on the hard disk volumes (partitions) to diskette.

Syntax

```
BACKUP [ <d:> ][ <path> ][ <filename.ext> ] <d:>
        [/S] [/M] [/A] [/D:mm-dd-yy] | ?
```

Comments

BACKUP ?

Displays a summary of the operation and purpose of BACKUP.

```
BACKUP [ <d:> ][ <path> ][ <filename.ext> ] <d:>
        [/S] [/M] [/A] [/D:mm-dd-yy]
```

The first three parameters indicate the file(s) to be backed up. Wild card characters may be used in filenames. If a path is not specified, files are backed up from the current directory. If a filename is not specified, all files in the directory will be backed up. These are followed by the designated diskette drive for the backup diskette.

Optional parameters include:

- | | |
|----|---|
| /S | Backup files in all subdirectories, at all levels below the specified directory, in addition to the files in the specified directory. |
| /M | Backup only those files that have been created or modified since the last BACKUP operation. This option avoids backing up unchanged files again. BACKUP automatically checks the attributes in the file's directory entry to see if it has been changed since the last time it was copied by this utility. (The CHATT utility shows if a file was modified since the last time it was backed up.) |

- /A** Add backup files to those already on the backup diskette in the specified drive. If this option is not specified, any backup files already on the diskette will be destroyed.
- /D:mm-dd-yy** Backup files which have been created or modified on or after the specified date.

Examples

BACKUP C: A:

Back up all files in the current directory of the hard disk C: to the backup diskette in drive A:.

BACKUP D:\DATA*.DOC A:

Back up all files with the filename extension .DOC, that are located in the \DATA directory of hard disk drive D:, to the backup diskette in drive A:.

BACKUP C:\USER B: /D:9-1-84

Back up all files in the \USER directory of hard disk drive C: that have been created or modified on or after September 1, 1984 to the backup diskette in drive B:.

BACKUP D:\ A: /S /M

Back up all files in the root and subdirectories of drive D: which have been modified since the last BACKUP operation.

After issuing a **BACKUP** command, a prompt to insert a backup diskette will be displayed. Use only MS-DOS formatted diskettes. Additional prompts will be displayed if more than one diskette is needed. The **BACKUP** utility sequentially numbers backup diskettes (0, 1, 2, ...), but these numbers are not viewable so users should label diskettes by sequence numbers.

The files on a backup diskette are not directly readable by standard utilities other than **DIR**, **BACKUP**, and **RESTORE**; the files must be restored before MS-DOS can use them. (See **RESTORE** command.) **BACKUP** will automatically erase existing files on the diskette unless the **/A** option is specified.

Users should avoid storing files created by **BACKUP** and standard utilities such as **COPY** on the same diskette. Such storage may cause problems.

Note Users should ignore any references to the **BACKUP** and **RESTORE** utilities found in the *MS-DOS User's Guide*.

Name	Type
BOOT	External

Purpose

Allows the user to designate the MS-DOS system boot drive or volumn (partition). The value set by BOOT is stored in battery-backed memory.

Syntax

BOOT [A:|C:|D:|STD|?]

Comments

BOOT

Reports the currently selected boot drive value.

BOOT ?

Displays a summary of the operation and purpose of BOOT.

BOOT A:

Instructs the system to boot from floppy diskette (drive A: first, followed by drive B: if A: is empty or does not contain a bootable system diskette).

BOOT C:

Instructs the system to boot from the currently active partition on drive C: (hard disk unit #0).

BOOT D:

Instructs the system to boot from the currently active partition on drive D: (hard disk unit #1).

BOOT STD

Instructs the system to follow the standard boot procedure by searching for a bootable system diskette or volume in the following predetermined order: Drive A:, B:, C:, D:. This is the default boot procedure for the system. (On C: and D:, only the active partitions are searched).

The designated system boot drive value is erased if a hard disk was designated as the boot drive and a different partition on that drive is activated (via HDSETUP option Activate). BOOT should then be run to designate a new system boot drive.

Name

CHATT

Type

External

Purpose

Changes and displays file attributes.

Syntax

CHATT < filespec > [... < attribute >] |?

The attribute can be (R|S|H|A) (+/-) where:

R is read-only

S is system

H is hidden

A is archive.

Comments

CHATT ?

Displays a summary of the purpose and operation of the utility.

CHATT < filespec >

Displays the attributes of the named file(s) in the following form.

< filename > . < ext > < attributes >

CHATT < filespec > < attributes >

Sets the specified attribute(s) of the named file(s). The (+ or -) character specifies whether a particular attribute bit is to be turned on or off. You can use wildcard characters (* or ?) in file name specifications.

The filespec, using MS-DOS 2.11 hierarchical pathnames, may be a maximum of 40 characters. The filespec allows:

28 characters for the path
12 characters for the filename

A longer path produces the error message:

CHATT; error: path too long

Example

CHATT *.EXE R+ A-

All .exe files on the default drive would be made read-only files with the archive bit turned off. As each file is modified, CHATT prints the filespec and its new set of attributes.

Name	Type
COLOR	External

Purpose

Allows the user to specify the default screen color for a color monitor, or the grey-tone intensity for a monochrome monitor.

Syntax

COLOR GREEN | WHITE | ?

Comments

COLOR ?

Displays a summary of the purpose and operation of COLOR.

COLOR GREEN or **COLOR WHITE**

Sets the default screen color to the color specified.

Name

Type

CRTDUMP

External

Purpose

Loads the CRTDUMP resident extension. Once loaded, CRTDUMP can dump the contents of the APC III screen to the printer. If the NEC Color Pinwriter is available, color dumps of the screen can be printed. Subsequent CRTDUMP commands can be issued to change the magnification factor in use without causing additional copies of the resident extension to be loaded.

Syntax

CRTDUMP [/x1 | /x2 | /x3 | NO | ?]

Comments

CRTDUMP ?

Displays a summary of the operation and purposes of this utility.

CRTDUMP must be loaded as a resident system extension prior to use. The optional magnification factor (/x1, /x2, /x3) is specified at this time and may be changed by reissuing the command. The default magnification is x1. Note that the magnification factors apply only to graphic mode dumps.

On monochrome graphic dumps, three sizes of output are available: x1, x2, and x3 magnification. The x1 output is 1.6 x 2.6 inches, the x2 output is 3.3 x 5.3 inches, and the x3 output is 5 x 8 inches in area.

Graphic dumps to the NEC Color Pinwriter are limited to a x1 and x2 magnification, with the x1 being 3.3 x 5.3 inches, and the x2 being 6.6 x 10.6 inches in area. If a request for a x3 dump to the color printer is made, a x2 dump will be produced.

Once CRTDUMP is loaded, a screen dump operation can be activated in different ways.

1. Via the keyboard:

Text Dump — Press < Shift > + < Print >

Graphic Dump — Press < Shift > + < Ctrl > + < Print >

2. Via an escape sequence:

Text Dump — ESC 80H 00H

Graphic Dump — ESC 80H 01H

ESC represents the ASCII escape character (1BH). 80H, 00H, and 01H are hexadecimal values representing a single ASCII character.

CRTDUMP sends its output to the default list device. This default device is defined by the battery-backed memory values that are set by the PRINTER utility. Therefore, the PRINTER utility should be run before you use CRTDUMP to ensure correct operation. If the PRINTER utility has set the Color Pinwriter as the default device, color dumps will be done.

All graphic dumps will be printed in 90-degree rotation (side-ways) on the page.

Note CRTDUMP will support graphic dumps to the NEC Pinwriter P2-3, P3-3 and the NEC Color Pinwriter printers only. If you attempt a graphic dump to any other printer, an error message will be printed. To abort a graphic dump in progress, simply make the printer go off-line by pressing the SEL button or lifting the clear plastic cover.

CRTDUMP NO

Deletes the CRTDUMP resident extension from system memory. This option should be used when necessary to regain the memory occupied by CRTDUMP.

Example

CRTDUMP /x2

loads CRTDUMP as a resident extension with a x2 magnification of graphic dumps. When you press < Shift > + < Ctrl > + < Print >, the current contents of the graphics screen are sent to the printer.

Name

Type

DISKCOMP

External

Purpose

Compares the contents of the diskette in the first specified drive to the contents of the diskette in the second specified drive.

Syntax

DISKCOMP [d:] [d:]

Comments

DISKCOMP is used to compare diskettes. This utility compares two entire diskettes with the same format on a track-by-track basis, and issues a message if the contents of tracks differ.

If the same drive is specified as source and destination, a single-drive comparison is performed. You will be prompted to insert the diskettes at the appropriate time. If both parameters are omitted, a single-drive comparison is performed on the default drive. If only one parameter is specified, the default drive is used as the second parameter.

When a diskette error is found, an error message similar to the following is displayed.

```
Compare error(s) on track nnn
Abort, Ignore?
```

This error message gives the location of the error. If you choose to ignore, DISKCOMP will continue to compare the rest of the diskette.

If you abort, the system will end the comparison and this prompt is displayed.

```
Compare more diskettes (Y/N)?
```

Type **Y** to start the comparison process again. Type **N** to end the program.

Name

DISP

Type

External

Purpose

Displays the APC III displayable character set on the CRT screen.

Syntax

DISP [?]

Comments

DISP ?

Displays a summary of the purpose and operation of DISP.

DISP

Displays the APC III character set.

Name	Type
HDSETUP	External

Purpose

Initializes and partitions the hard disk into variably sized volumes.

Syntax

HDSETUP [?]

Comments

HDSETUP ?

Displays a summary of the purpose and operation of HDSETUP.

HDSETUP

Displays the current hard disk partition table followed by a menu listing these options:

- Activate — Chooses the active MS-DOS partition.
- Create — Creates an MS-DOS partition.
- Delete — Deletes an MS-DOS partition.
- Format — Formats the specified tracks.
- Select — Selects the hard disk unit number.
- Exit — Exits the HDSETUP program.

These options are user selectable by typing the first letter of the option. HDSETUP then displays prompts for inputting any required parameters. A complete description of the steps necessary to set up a hard disk, including examples, is provided in Chapter 2 of this document.

Note After a hard disk has been selected as the system boot drive (via the BOOT utility or the function key method), creating or deleting a partition, or activating a different partition on that drive voids the selection. After exiting HDSETUP, run the BOOT utility to select the boot unit.

Name	Type
KEY	External

Purpose

Allows reprogramming of the APC III keyboard, including the programmable function keys.

Syntax

```
KEY  
KEY < assignment >  
KEY DUMP [ > < filespec > ]  
KEY RESET | SIZE | ?
```

Comments

Command syntax:

KEY ?

Displays a summary of the operation and purpose of KEY.

KEY DUMP

Dumps the current key definitions to standard output. These definitions are in the form of valid key input commands and may be redirected to a file with the > operator for editing and reuse. (Refer to Chapter 4 of the *MS-DOS User's Guide* for information on standard input, output, and redirection.)

KEY SIZE

Informs you how much available space remains in the key reassignment buffer.

KEY RESET

Returns the key definitions to their boot-time defaults.

KEY < assignment >

Tells KEY to reprogram a key. The < assignment > command format is as follows:

< key > [< shift specifier >] < new code(s) >

Taken together, the < key > and < shift specifier > identify which key and shift state you are going to redefine; < new code(s) > tells what the new definition is; that is, what code the key will produce when you press it.

< key > specifies the actual key being referenced, usually the character printed on the keytop. For many shifted keys, the shift state can be indicated by the character itself. No < shift identifier > is necessary. For example, "A" is equivalent to "a shift" or "A shift." These keys are:

```
! @ # $ % & ( ) — + ~
Q W E R T Y U I O P { } |
A S D F G H J K L : "
Z X C V B N M < > ?
clear      break
```

All other key / shift states must be identified by a key identifier and optional shift specifier. The key identifiers are:

```
pf1 pf2 pf3 pf4 pf5 pf6 pf7 pf8 pf9 pf10 pf11 pf12
pgup pgdn
esc 1 2 3 4 5 6 7 8 9 0 - = ' ! @ # $ % & * ( ) — + ~
back
tab q w e r t y u i o p [ ] \ Q W E R T Y U I O P { } |
a s d f g h j k l ; ' A S D F G H J K L : " Return
z x c v b n m , . / Z X C V B N M < > ?
space help
ins del home print stop clear break
curup curdn currt curlft enter
```

The < shift specifier > is one or more of the following:

shift gr1 gr2 alt fnc ctrl

The < new code > part consists of a combination of character strings enclosed in double quotes (") and ASCII codes. ASCII codes may be entered in decimal (three digit maximum) or hexadecimal (in the form 0x##, two digit maximum). The double quote character may be entered in a string by specifying \". The backslash character may be specified by \\.

KEY

Starts interactive key reprogramming which allows multiple < assignments > to be entered through standard input (by default, the keyboard). Also, by using redirection of input, (the < operator), you can specify a text file containing multiple key assignments as the source of < assignment >s.

Examples

Following are several examples of valid commands.

1. Multiple command entry:

```
KEY                                     (multiple commands)
PF3 CTRL "DIR A:" 13 "PATH B:\"" 0X0D  (13 or 0Dh is
PF4 FNC  "KEY < SPECIAL.KEY"13        ASCII carriage
PF5 "PRINTER" 0X0D                    return)
^ Z (CTRL + Z ( ^ Z) indicates END OF FILE on
STANDARD INPUT)
```

CTRL + PF3, FNC + PF4, AND PF5 have now been programmed along with any previously defined keys. Pressing PF5 at this point is the same as entering "PRINTER", which is the command for the PRINTER utility.

2. DUMPing key definitions to a file:

KEY DUMP >special.key

This command, which can be entered in a batch file, dumps the current key definitions to the file special.key so that they can be reentered at another time. Special.key or any other key definitions file can also be edited to add or delete key definitions.

3. Command line key assignment:

KEY PF7 FNC "path\\util\\user" 13

When you execute this example of the command line form of a key assignment, press FNC + PF7 to set the following:

PATH = \UTIL\USER

4. Redirecting key definitions from a file:

KEY < special.key

The command uses standard input to load the key definitions from the file special.key. This file consists of valid key commands, which are entered in a multiple assignment format.

Some shift states are not available for some keys (refer to Appendix H of the *APC III Supplement to MS-DOS Programmer's Reference Manual*). If an assignment is attempted for such a combination, an error message will be displayed.

Note KEY provides maximum flexibility in allowing any keyboard key to be reprogrammed. Users should note that difficulties can arise when keys are indiscriminately remapped. For example, reprogramming the Return key can effectively hang the system unless another key has been remapped to issue a Return to the system.

Name	Type
KEYCLICK	External

Purpose

Turns the keyclick tone on or off.

Syntax

KEYCLICK ON | OFF | ?

Comments

When KEYCLICK is on, the keyboard produces a clicking sound when you press a key, providing audible typing feedback.

KEYCLICK ?

Displays a summary of the operation and purpose of KEYCLICK.

Name

LORES

Type

External

Purpose

Sets an 80 x 25 character screen display mode.

Syntax

LORES [?]

Comments

LORES

Sets the screen display to the 80 x 25 character text mode. The main purpose of the utility is to enable the user with a low resolution CRT monitor to reset the screen mode, which is automatically set to 40 x 25 at boot time for use with a tv display.

LORES ?

Displays a summary of the purpose and operation of LORES.

Name	Type
MOUSE	External

Purpose

Configures the GSX device driver to accept input from a mouse. The device driver will set the serial port baud rate and communications protocol for the specified mouse.

Syntax

MOUSE < type > [< port >] | ?

The < type > can be one of the following:

summa	selects SummaGraphics mouse.
mouse	selects Mouse Systems mouse.
NONE	selects no mouse. This type is necessary when using a serial output device.

The < port > can be one of the following:

AUX	selects the standard serial port.
AUX2	selects the first optional serial port.
AUX3	selects the second optional serial port.

Comments

MOUSE ?

Displays a summary of the purpose and operation of the MOUSE utility.

MOUSE < type >

Specifies the type of mouse to be used. The mouse types may be abbreviated to their shortest form. For example, s is a valid abbreviation for summa. If not specified, the port defaults to AUX.

MOUSE NONE

Disables the MOUSE option. With this option, the serial port baud rate and protocol remain unchanged, and serial data devices, such as plotters, can be used under GSX. Note that with the optional serial port board, a plotter can be attached to the standard port, and a mouse to one of the auxiliary ports.

The MOUSE utility only modifies the GSX driver (DDAPC-III.SYS) that is present on the logged-in disk. No change is made to the GSX system in memory. Therefore, if the GSX system has been loaded and the MOUSE utility is run, GSX must be unloaded and reloaded to effect a change.

Example

MOUSE SUMMA AUX2

This configures the device driver for the SummaGraphics mouse.

Name	Type
PRINTER	External

Purpose

Configures the APC III MS-DOS system for the interface type and printer model to be used as the default PRN device.

Syntax

PRINTER [[< type >] [< interface >] [< parity >] | ?]

The printer types include:

P2-3PINWRITER	NEC2030
P3-3PINWRITER	Colorpinwriter
NEC2050	Other
NEC3530	
NEC7730	
NEC3550	

The interface includes:

stdserial or AUX	(for standard serial port)
parallel	(for parallel port)
AUX2	(for first optional standard serial port)
AUX3	(for second optional standard serial port)

Parity includes:

even
odd
none.

Note The default setting for PRINTER interface and data pins is Centronics/ 16 pin which is suitable for the NEC printers named under printer types in the preceding list.

Comments

PRINTER ?

Displays a summary of the purpose and operation of PRINTER.

PRINTER

Invokes the interactive form of the command. The screen is cleared and a menu similar to the following appears.

```

Printer configuration
Printer model:
    NEC Pinwriter P2-3      NEC 2050      NEC 3530      NEC 3550
    NEC Pinwriter P3-3      NEC 7730      NEC 2030      other
    NEC Color Pinwriter
PRN Device:
    Parallel port          Standard RS-232 port AUX
    Optional RS-232 port AUX2  Optional RS-232 port AUX3
Parallel port parity:
    even                  odd                  none

Cursor keys move cursor; space bar selects item;
Esc exits without changing parameters;
Return changes parameters and exits.
  
```

The current system settings are underlined. You can select parameters by moving the reverse video cursor over the desired item and pressing the space bar.

PRINTER < type > < interface > < parity >

< type > specifies the model printer to be used and sets the appropriate default values of interface and parity for supported printers. These may be overridden by specifying the interface and parity to be used.

< interface > specifies the interface type (serial or parallel) and port.

< parity > specifies parity for a parallel interface.

You can abbreviate command line parameters to their shortest form, like `par` for parallel, or `std` for `stdserial`. The values set by the interactive mode and the command line are identical, and are stored in the battery-backed memory. Because of this, there is no need to run `PRINTER` again unless you change the printer itself. `PRINTER` accepts a maximum of three parameters which must be specified in the order shown on the command line.

Note If you configure the system with an RS232 serial port as the system printer (default PRN device), the `SETCOM` utility must be used to set the appropriate baud rate, parity, number of data bits, and stop bits.

Name	Type
RAMDISK	External

Purpose

Turns the ramdisk option on or off, and sets the size of the ramdisk.

Syntax

RAMDISK [OFF | <ramdisk size > | ?]

Ramdisk sizes are 128K, 256K, 384K, or 512K (bytes).

Comments

The ramdisk utility allows the allocation (in increments of 128 KB) of part of the RAM to be used as a pseudo-disk (accessed by disk drive designation E:).

Issuing this command without any parameters returns the ramdisk to its current setting of the ramdisk enable, and, if the ramdisk is in use, returns its current size.

RAMDISK ?

Provides a summary of the operation and purpose of RAMDISK.

RAMDISK < ramdisk size >

Enables the RAMDISK option. The ramdisk capacity will be the specified size, and remaining RAM will be allocated as system memory.

RAMDISK OFF

Disables the ramdisk option. All RAM will be allocated as system memory.

In addition to issuing the RAMDISK command, you must reboot the system for any changes to take effect. The ramdisk enable and ramdisk size are stored in the battery-backed memory so that once set, the RAMDISK utility is only needed to make a change in the setting.

Note Any information written to the ramdisk must be stored elsewhere before powering down the system. The contents of the ramdisk will not be lost by performing a warm boot (< Fnc > + < Ctrl > + < Break >), but will be lost by performing a cold boot (pressing RESET) or by turning off the power.

Example

RAMDISK 256K

In a system with 512 KB of RAM, entering this command (after you reboot) creates a 256 KB ramdisk. This leaves 256 KB as system memory.

RAMDISK OFF

In the same system as above, this command (also after you reboot) disables the ramdisk. This allocates the entire 512 KB of RAM as system memory.

Note that a minimum of 256 KB of RAM is required to use the ramdisk option. 128 KB is the minimum system memory, and 128 KB is the minimum ramdisk size.

Any attempt to establish a ramdisk with insufficient RAM, or to specify a ramdisk size that would leave less than the minimum required system memory (128 KB) will result in the maximum legal ramdisk being selected.

For example, consider an APC III with 384 KB of RAM installed. If the command “RAMDISK 384” is issued, the following message is displayed.

RAMDISK: Specified ramdisk was too large

**RAMDISK has been set to 256k
System memory size is 128k**

Name	Type
RESTORE	External

Purpose

Restores files from backup diskettes to the hard disk volume.

Syntax

```
RESTORE <d:>[<d:>] [<path>] [<filename.ext>]  
[ /S ] [ /P ] ?
```

Comments**RESTORE ?**

Displays a summary of the purpose and operation of RESTORE.

```
RESTORE <d:> [<d:>] [<path>] [<filename.ext>]  
[ /S ] [ /P ]
```

The first parameter indicates the diskette drive containing the backup diskette. The next three parameters describe the files being restored to the hard disk. Wild card characters may be used in filenames. Files are restored to the current directory if no path is specified. If no filename is specified, all files backed up from the directory (current or specified) will be restored.

Optional parameters include:

- /S Restore backed up files in all subdirectories of the specified directory, in addition to the files in the specified directory itself.
- /P Display a prompt before restoring a file that has been modified since the last BACKUP of the file. RESTORE will also display a prompt if a file has a read-only, hidden, or system attribute. This action allows the user to decide whether or not to restore the file.

Examples

```
RESTORE A: C:
```

Restores all files from the backup diskette in diskette drive A: to the current directory of hard disk C:.

```
RESTORE A: D:\DATA\*.DOC
```

Restores all files from the backup diskette in drive A: with the extension .DOC to the \DATA directory of drive D:.

```
RESTORE A: C:\USER /P
```

Restores all files in the \USER directory of drive C: from the backup diskette in drive A:. RESTORE will display one of the following prompts before restoring any file that has been modified since the last backup or is designated as a read-only, system, or hidden file.

```
Warning ! File TAX.DAT  
was changed after it was backed up  
Replace the file (Y/N) ?n
```

```
Warning ! File IO.SYS  
is a read only, system, or hidden file  
Replace the file (Y/N)?y
```

This makes it possible to restore a set of backup files, which may include one or two changed files, without issuing several RESTORE commands.

```
RESTORE A: D:\ /S
```

Restores all files on the backup diskette in drive A: to the root and subdirectories of drive D:.

A BACKUP operation may produce several sequentially-numbered backup diskettes. If you wish to restore all files on a set of backup diskettes — for example, to recreate the contents of a partition — begin with diskette number 0; RESTORE will prompt you to insert other diskettes as necessary.

Note Users should ignore any references to the BACKUP and RESTORE utilities found in the *MS-DOS User's Guide*.

Name

RETRACT

Type

External

Purpose

Retracts the access arm of the hard disk unit to its safe landing area.

Syntax

RETRACT

Comments

RETRACT

Retracts the heads of all hard disk units attached to the APC III. RETRACT should always be run before shutting off power to a hard disk system to prevent possible loss of data and excessive head wear.

Name	Type
SETCOM	External

Purpose

Sets the operating parameters for the standard and optional serial ports.

Syntax

```
SETCOM [ < baud data parity stop protocol > [ < port > ]  
        [ INIT | ? ]
```

Comments

SETCOM ?

Displays a summary of the purpose and operation of SETCOM.

SETCOM INIT

Initializes all serial ports to the parameters currently stored in the AUX Control Table.

SETCOM < baud data parity stop protocol > [< port >]

This is a command line form of the utility that sets any or all of the five operating parameters to the following values:

baud rate — 9600, 4800, 2400, 1200, 600, 300, 150, 75

data bits — 7data or 8data

parity — even, odd, none

stop bits — 1stop, 2stop, or 1.5stop

protocol — xon/xoffprotocol,noprotoocol

You can specify the parameters in any order. If there is a conflict (e.g., 2 baud rates are specified) the last one given will be used. Parameters are set once the entire command line has been parsed. If there is an error, the system displays an error message, and the command is ignored. You can abbreviate these parameters to their shortest forms. For example, 48 is a valid abbreviation of 4800.

The port to be initialized may be specified as one of the following:

- /AUX (the standard serial port)
- /AUX2 (the first optional serial port)
- /AUX3 (the second optional serial port)

If no port is specified, the default standard RS-232C serial port will be initialized.

In order for the two optional serial ports, AUX2 and AUX3, to operate correctly, the Optional Dual RS-232C Serial Port Device Driver (OPTRS232.SYS) must be installed during system initialization. To install the driver at initialization, the file CONFIG.SYS must contain a line reading "DEVICE = OPTRS232.SYS". In addition, the CONFIG.SYS and OPTRS232.SYS files must be located in the root directory of the system boot drive along with the system files. Remember to copy these files along with the system files when changing or creating a new system diskette. (Refer to the *APC III Supplement to MS-DOS Programmer's Reference Guide* for more information.)

Examples

```
SETCOM 9600 1STOP 7DATA EVEN
```

This configures the standard serial port for 9600 baud, 7 data bits, even parity, and 1 stop bit.

```
SETCOM 1200 /AUX
```

This sets the baud rate for the standard serial port to 1200; all other parameters are unchanged.

SETCOM 2400 2STOP 1200 /AUX3

This sets 2 stop bits, and sets the baud rate to 1200 for the second optional serial port; the 2400 parameter is ignored, and all other parameters are unchanged.

SETCOM

If no parameters are entered, the interactive mode is invoked. The screen is cleared and the following menu appears.

```
AUX Device:      AUX      AUX2      AUX3
75   150   300   600   1200   2400   4800   9600   Baud

      7 data bits      8 data bits

even parity      odd parity      no parity

1 stop bit      1.5 stop bits      2 stop bits

XON/XOFF Protocol      No Protocol

Cursor keys move cursor; space bar selects item;
Esc exits without changing parameters;
Return changes parameters and exits.
```

The current settings are underlined. To change a setting, move the cursor to the desired value, then press the space bar to select it.

The AUX2 and AUX3 parameters on the first line of the menu appear only if the optional dual-port RS-232C board is installed in the APC III. The user may then select a port to read or change its parameters. When < Return > is pressed, all three ports (if they exist) will be initialized.

The parameters for the standard and first optional serial port are stored in battery-backed memory and therefore are preserved even when the system is turned off. At boot time, SETCOM must still be run to initialize the ports.

SETCOM initializes the serial ports with infinite time-outs for both send and receive. If this is not acceptable, the user should use the RS232C_IO ROM BIOS call to initialize the time-outs to desired specifications.

Note When a serial interface printer is used with the APC III, a standard modem eliminator or similar wiring interface is necessary to couple the serial printer to the APC III.

Name	Type
8087	External

Purpose

Provides a software controlled method to indicate the presence or absence of an 8087-2 processor. This indicator is stored in battery-backed memory.

Syntax

8087 ON|OFF|?

Comments

8087 ?

Displays a summary of the purpose and operation of the 8087 utility.

8087 ON

Sets the internal indicator to show the presence of the 8087-2. An installed 8087-2 processor is operational regardless of the internal indicator setting. However, some programs may read the indicator setting to determine processing methods.

8087 OFF

Sets the internal indicator to show the absence of the 8087-2.

USER'S COMMENTS FORM

Document: APC III Supplement to MS-DOS User's Guide

Document No.: 819-150010-000 Rev. 01

Please suggest improvements to this manual.

Please list any errors in this manual. Specify by page.

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Microsoft[®] MS[™]-DOS

Operating System

User's Guide

Microsoft Corporation

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MS-DOS Version 2.0 Package Contents

1 disk with the following files:

CHKDSK.COM
COMMAND.COM
DEBUG.COM
DISKCOPY.COM
EDLIN.COM
FIND.EXE
FC.COM
FORMAT.COM
IO.SYS (hidden file)
LINK.EXE
EXE2BIN.EXE
MORE.COM
MSDOS.SYS (hidden file)
PRINT.COM
RECOVER.COM
SORT.COM
SYS.COM

2 manuals:

The MS-DOS User's Guide
The MS-DOS Programmer's Reference Manual

System Requirements

The MS-DOS operating system requires an 8086 or 8088 microcomputer system. The operating system itself runs in and requires 32K bytes of memory.

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

1.1	WHAT IS MS-DOS?	1-2
1.2	WHAT IS AN OPERATING SYSTEM?	1-2
1.3	WHY IS MS-DOS SO IMPORTANT?	1-3
1.4	ABOUT THIS MANUAL	1-3
1.5	SYNTAX NOTATION	1-4
1.6	MS-DOS FILES	1-4

CHAPTER 2 GETTING STARTED

2.1	WHAT HAPPENS WHEN YOU FIRST LOAD MS-DOS?	2-2
2.2	HOW TO ENTER THE DATE AND TIME	2-2
2.3	HOW TO CHANGE THE DEFAULT DRIVE	2-4
2.4	HOW TO FORMAT YOUR DISKS	2-4
2.4.1	The FORMAT Command	2-5
2.5	HOW TO BACK UP YOUR DISKS	2-6
2.5.1	The DISKCOPY Command	2-6
2.6	AUTOMATIC PROGRAM EXECUTION	2-8
2.7	FILES	2-9
2.7.1	What Is A File?	2-9
2.7.2	How MS-DOS Keeps Track Of Your Files	2-9
2.7.3	The DIR (Show Directory) Command	2-9
2.7.4	The CHKDSK (Check Disk) Command	2-11
2.8	HOW TO TURN THE SYSTEM OFF	2-11

CHAPTER 3 MORE ABOUT FILES

3.1	HOW TO NAME YOUR FILES	3-2
3.2	WILD CARDS	3-3
3.2.1	The ? Wild Card	3-3
3.2.2	The * Wild Card	3-4
3.3	ILLEGAL FILENAMES	3-5
3.4	HOW TO COPY YOUR FILES	3-5
3.5	HOW TO PROTECT YOUR FILES	3-7
3.6	DIRECTORIES	3-7
3.7	FILENAMES AND PATHS	3-10
3.7.1	Pathnames	3-10
3.7.2	Pathing And External Commands	3-11
3.7.3	Pathing And Internal Commands	3-12
3.7.4	Displaying Your Working Directory	3-13
3.7.5	Creating A Directory	3-13
3.7.6	How To Change Your Working Directory	3-14
3.7.7	How To Remove A Directory	3-14

CHAPTER 4 LEARNING ABOUT COMMANDS

4.1	INTRODUCTION	4-2
4.2	TYPES OF MS-DOS COMMANDS	4-2
4.3	COMMAND OPTIONS	4-3
4.4	INFORMATION COMMON TO ALL MS-DOS COMMANDS	4-4
4.5	BATCH PROCESSING	4-6
4.6	THE AUTOEXEC.BAT FILE	4-8
4.6.1	How To Create An AUTOEXEC.BAT File	4-11
4.7	CREATING A .BAT FILE WITH REPLACEABLE PARAMETERS	4-12
4.7.1	Executing A .BAT File	4-13
4.8	INPUT AND OUTPUT	4-13
4.8.1	Redirecting Your Output	4-14
4.8.2	Filters	4-14
4.8.3	Command Piping	4-15

CHAPTER 5 COMMANDS

5.1	COMMAND FORMATS	5-2
5.2	COMMANDS	5-2
	BACKUP	5-5
	BREAK	5-7
	CHDIR	5-8
	CHKDSK	5-9
	CLS	5-14
	COPY	5-15
	CTTY	5-19
	DATE	5-20
	DEL	5-22
	DIR	5-23
	DISKCOPY	5-24
	EXE2BIN	5-27
	EXIT	5-30
	FIND	5-31
	FORMAT	5-33
	MKDIR	5-35
	MORE	5-36
	PATH	5-37
	PRINT	5-38
	PROMPT	5-41
	RECOVER	5-43
	REM	5-44
	REN	5-45
	RESTORE	5-46
	RMDIR	5-47
	SET	5-48
	SORT	5-49
	SYS	5-51
	TIME	5-53
	TYPE	5-54
	VER	5-55
	VERIFY	5-56
	VOL	5-57

5.3	BATCH PROCESSING COMMANDS	5-58
	ECHO	5-58
	FOR	5-59
	GOTO	5-60
	IF	5-61
	PAUSE	5-62
	SHIFT	5-63

CHAPTER 6 MS-DOS EDITING AND FUNCTION KEYS

6.1	SPECIAL MS-DOS EDITING KEYS	6-2
6.2	CONTROL CHARACTER FUNCTIONS	6-6

CHAPTER 7 EDLIN

7.1	INTRODUCTION	7-2
7.2	HOW TO START EDLIN	7-2
7.3	SPECIAL EDITING KEYS	7-3
7.4	COMMAND INFORMATION	7-17
7.4.1	Command Options	7-20
7.5	EDLIN COMMANDS	7-21
7.6	ERROR MESSAGES	7-47

CHAPTER 8 FILE COMPARISON UTILITY (FC)

8.1	INTRODUCTION	8-2
8.1.1	Limitations On Source Comparisons	8-2
8.2	FILE SPECIFICATIONS	8-2
8.3	HOW TO USE FC	8-3
8.4	FC SWITCHES	8-3
8.5	DIFFERENCE REPORTING	8-5
8.6	REDIRECTING FC OUTPUT TO A FILE	8-6
8.7	EXAMPLES	8-6
8.8	ERROR MESSAGES	8-10

CHAPTER 9 THE LINKER PROGRAM (MS-LINK)

9.1	INTRODUCTION	9-2
9.2	OVERVIEW OF MS-LINK	9-2
9.3	DEFINITIONS YOU'LL NEED TO KNOW	9-5
9.4	FILES THAT MS-LINK USES	9-7
9.4.1	Input File Extensions	9-7
9.4.2	Output File Extensions	9-7
9.4.3	VM.TMP (Temporary) File	9-8
9.5	HOW TO START MS-LINK	9-9
9.5.1	Method 1: Prompts	9-10
9.5.2	Method 2: Command Line	9-11
9.5.3	Method 3: Response File	9-12
9.6	COMMAND CHARACTERS	9-14
9.7	COMMAND PROMPTS	9-16
9.8	MS-LINK SWITCHES	9-18
9.9	SAMPLE MS-LINK SESSION	9-22
9.10	ERROR MESSAGES	9-24

APPENDIX A	INSTRUCTIONS FOR USERS WITH SINGLE-DRIVE SYSTEMS
APPENDIX B	DISK ERRORS
APPENDIX C	ANSI ESCAPE SEQUENCES
APPENDIX D	HOW TO CONFIGURE YOUR SYSTEM
APPENDIX E	MS-DOS MESSAGE DIRECTORY
Index	

CHAPTER 1

INTRODUCTION

What Is MS-DOS?

What Is An Operating System?

Why Is MS-DOS So Important?

About This Manual

Syntax Notation

MS-DOS Files

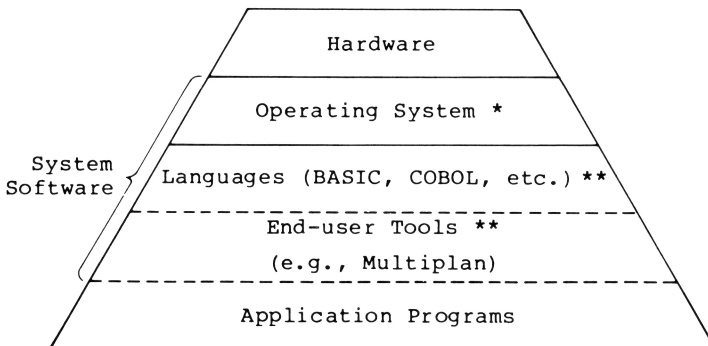
1.1 WHAT IS MS-DOS?

Microsoft(R) MS(tm)-DOS is a disk operating system for 8086/8088-based computers. Through MS-DOS, you communicate with the computer, disk drives, and printer, managing these resources to your advantage.

1.2 WHAT IS AN OPERATING SYSTEM?

An operating system is your "silent partner" when you are using the computer. It provides the interface between the hardware and both you (the user) and the other system software. An operating system can be compared to the electricity in a house--you need it for the toaster and the blender to work, but you are not always aware that it's there.

An operating system (OS) is the piece of system software most closely associated with the hardware. The OS is unique to the microprocessor (computer). For example, MS-DOS runs on the 8086/8088 microprocessor family and will not run on another microprocessor (like the Z8000) unless major parts of the OS are rewritten. Figure 1 illustrates how the hardware, the system software and the application software are related.



* Must adapt to new hardware

** If adapted to operating system, these don't change

Figure 1. Hardware/Software Relationships

MS-DOS is a disk operating system that enables you to create and keep track of files, run and link programs, and access peripheral devices (for example, printers and disk drives) that are attached to your computer. MS-DOS is an important advance in microprocessor operating systems.

1.3 WHY IS MS-DOS SO IMPORTANT?

All Microsoft languages (BASIC Interpreter, BASIC Compiler, FORTRAN, COBOL, Pascal) are available under MS-DOS. Users of MS-DOS are assured that their operating system will be the first that Microsoft will support when any new products or major releases are announced.

1.4 ABOUT THIS MANUAL

This manual describes MS-DOS and how to use it. This chapter introduces some basic MS-DOS concepts; Chapter 2 discusses how to start using MS-DOS and how to format and back up your disks.

Chapter 3 tells you about files--what they are and how to use them. Chapters 4 through 6 introduce MS-DOS commands and Chapter 7 describes the line editor, EDLIN. Read these chapters carefully--they contain information on protecting your data, system commands, and the MS-DOS editing commands.

Chapter 8 explains how to use the MS-DOS File Comparison utility, FC. This utility is helpful when you need to compare the contents of two source or binary files.

If you are writing programs and want to link separately-produced object modules and create relocatable modules, Chapter 9 describes a useful MS-DOS utility, MS-LINK.

Appendices to this manual include instructions for users with one-disk-drive systems and disk error messages.

If you want to know more, the MS-DOS Programmer's Reference Manual describes system architecture, how to install device drivers, and system calls and interrupts.

1.5 SYNTAX NOTATION

The following syntax notation is used throughout this manual in descriptions of command and statement syntax:

- [] Square brackets indicate that the enclosed entry is optional.
- < > Angle brackets indicate data you must enter. When the angle brackets enclose lower case text, you must type in an entry defined by the text; for example, <filename>. When the angle brackets enclose upper case text, you must press the key named by the text; for example, <RETURN>.
- { } Braces indicate that you have a choice between two or more entries. At least one of the entries enclosed in braces must be chosen unless the entries are also enclosed in square brackets.
- ... Ellipses indicate that an entry may be repeated as many times as needed or desired.
- | A bar indicates an OR statement in a command. When used with an MS-DOS filter, the bar indicates a pipe.
- CAPS Capital letters indicate portions of statements or commands that must be entered, exactly as shown.

All other punctuation, such as commas, colons, slash marks, and equal signs, must be entered exactly as shown.

1.6 MS-DOS FILES

The MS-DOS disk contains the following files:

File Name	Function of File
COMMAND.COM	MS-DOS command processor
* MSDOS.SYS	MS-DOS operating system
* IO.SYS	Hardware-operating system interface
EDLIN.COM	Line editor
DEBUG.COM	Debugger
LINK.EXE	Linker
CHKDSK.COM	Checks disks
FORMAT.COM	Formats disks
SYS.COM	Transfers system
DISKCOPY.COM	Backup utility
RECOVER.COM	Recovers disks
PRINT.COM	Print spooler
MORE.COM	Reviews text

SORT.EXE	Sorts text
FIND.EXE	Finds a string in a list of files or standard input
EXE2BIN.EXE	Converts .EXE files
CONFIG.SYS	System configuration file
FC.EXE	Compares files
RESTORE.EXE	Restores files
BACKUP.EXE	Backs up files

You will recognize this list of files when you have learned the DIR (Show Directory) command described in the next chapter. The two files preceded by an asterisk (*) are "hidden" files and will not appear when you enter a DIR command.

In the next chapter, you will learn how to start your MS-DOS system and how to format and back up your disks.

CHAPTER 2

GETTING STARTED

What Happens When You First Load MS-DOS?

How To Enter The Date And Time

How To Change The Default Drive

How To Format Your Disks

 The FORMAT Command

How To Back Up Your Disks

 The DISKCOPY Command

Automatic Program Execution

Files

 What Is A File?

 How MS-DOS Keeps Track Of Your Files

 The DIR (Show Directory) Command

 The CHKDSK (Check Disk) Command

How To Turn The System Off

2.1 WHAT HAPPENS WHEN YOU FIRST LOAD MS-DOS?

Follow your computer manufacturer's instructions to insert and load the MS-DOS disk into your system. Loading MS-DOS takes from 3 to 45 seconds, depending on the size of memory in your computer.

Once MS-DOS has been loaded, the system searches the MS-DOS disk for the COMMAND.COM file and loads it into memory. The COMMAND.COM file is a program that processes the commands you enter and then runs the appropriate programs. It is also called the command processor.

When the command processor is loaded, you will see the following display on your screen (the underscore represents the cursor):

```
MS-DOS Version 2.00
Copyright 1981, 1982 Microsoft Corp.

Command V. 2.02
Current date is Wed 1-02-1981
Enter new date: _
```

You must now enter today's date and time at your terminal.

2.2 HOW TO ENTER THE DATE AND TIME

Type today's date in an mm-dd-yy format, where:

mm is a one- or two-digit number from 1-12
(representing month)

dd is a one- or two-digit number from 1-31
(representing day of month)

yy is a two-digit number from 80-99 (the 19 is
assumed), or a four-digit number from
1980-2099 (representing year)

Any date is acceptable in answer to the new date prompt as long as it follows the above format. Separators between the numbers can be hyphens (-) or slashes (/). For example:

6-1-82 or 06/01/82

are both acceptable answers to the Enter new date: prompt.

If you enter an invalid date or form of date, the system will prompt you again with Enter new date:.

After you respond to the new date prompt and enter your

answer by pressing the <RETURN> key (or <ENTER> key on some terminals), you will see a prompt similar to this:

```
Current time is 8.30:14.32
Enter new time: _
```

Enter the current time in the hh:mm format, where:

```
hh      is a one- or two-digit number from 0-23
        (representing hours)

mm      is a one- or two-digit number from 0-59
        (representing minutes)
```

MS-DOS uses this time value to keep track of when you last updated and/or created files on the system. Notice that MS-DOS uses 24-hour time; for instance, 1:30 p.m. is written 13:30.

Example:

```
Current time is 0:00:14.32
Enter new time: 9:05
```

You should only use the colon (:) to separate hours and minutes. If you enter an invalid number separator, MS-DOS will repeat the prompt.

NOTE

If you make a mistake while typing, press the control key on your keyboard, hold it down, and then press the C key. This <CONTROL-C> function will abort your current entry. You can then re-answer the prompt or type another command. To correct a line before you press <RETURN>, use the <BACKSPACE> key to erase one letter at a time.

You have now completed the steps for starting MS-DOS.

2.3 HOW TO CHANGE THE DEFAULT DRIVE

After you have answered the new time prompt, a message is displayed that looks like this:

```
A>_
```

The A> is the MS-DOS prompt from the command processor. It tells you that MS-DOS is ready to accept commands. If you have inserted the MS-DOS disk into a drive other than A:, the command processor prompt will reflect that drive (for example, B>). However, usually you will load MS-DOS in drive A:.

The A in the previous prompt represents the default disk drive. This means that MS-DOS will search only the disk in drive A: for any filenames you may enter and will write files only to that disk unless you specify a different drive. You can ask MS-DOS to search the disk in drive B: by changing the drive designation or by specifying B: in a command. To change the disk drive designation, enter the new drive letter followed by a colon. For example:

```
A>      (MS-DOS prompt)
A>B:    (you have typed B: in response to
        the prompt)
B>      (system responds with B: and drive B:
        is now the default drive)
```

The system prompt B> will appear and MS-DOS will search only the disk in drive B: until you specify a different default drive.

If you have only one disk drive attached to your computer, turn to Appendix A, "Instructions for Users with Single-Drive Systems," for important information. Your computer may have more than 2 disk drives; refer to your computer manufacturer's instructions on the use of these drives.

2.4 HOW TO FORMAT YOUR DISKS

You must "format" all new disks before they can be used by MS-DOS.

A blank disk must be formatted with the MS-DOS FORMAT command. The FORMAT command changes the disk to a format that MS-DOS can use; it also analyzes the disk for defective tracks. If the disk is not already blank, formatting it will destroy any data that exists on the disk. Although this can be a convenient way to make a blank disk,

it is recommended that the MS-DOS DELETE command be used for this purpose. Refer to Chapter 5, "MS-DOS Commands," for more information on the DELETE command.

2.4.1 The **FORMAT** Command

The syntax of the **FORMAT** command is:

```
FORMAT [d:]
```

where:

d: is the drive designation (the drive that contains the disk to be formatted)

Note that the brackets identify optional information. If you do not specify a disk drive (for example, A: or B:), MS-DOS will format the disk in the default drive.

With the MS-DOS disk already in drive A:, you are ready to format your new blank disk. The following command will format the new disk in drive B:.

```
FORMAT B:
```

MS-DOS issues the following message:

```
Insert new diskette for drive B:
and strike any key when ready
```

After you insert the new disk in drive B: and press any key on the keyboard, the system responds:

```
Formatting...
```

while MS-DOS is formatting your disk. If you add the /V switch to the **FORMAT** command, MS-DOS will ask for the volume label of the disk. (See below.) The /S switch tells MS-DOS to copy its system files onto the new disk.

(Note: this message may not appear on your screen.)

When the formatting is finished, MS-DOS will issue a message similar to this:

```
Formatting...Format complete
System transferred
```

```
Volume label (11 characters. RETURN for none)?
```

Volume labels are useful to identify disks--they are like a

name tag for each disk. When you assign a unique volume label to a disk, you can always be sure that you know which disk you are using. The volume label you assign to a disk is displayed by issuing the MS-DOS VOL command (refer to Chapter 5, "MS-DOS Commands," for more information on the VOL command). Type a volume label in response to the above prompt if you want to identify this disk, and press <RETURN>. An example of a volume label is PROGRAMS. If you do not want to attach a label to this disk, simply press the <RETURN> key. You will see on your screen a message similar to this:

```
160256 bytes total disk space
12800 bytes used by system
143360 bytes available on disk
```

Format another (Y/N)?_

Type Y to format another disk. Type N to end the FORMAT program.

2.5 HOW TO BACK UP YOUR DISKS

It is strongly recommended that you make backup copies of all your disks. If a disk becomes damaged or if files are accidentally erased, you will still have all of the information on your backup disk. You should make a backup copy of your MS-DOS disk also. You can back up disks by using the MS-DOS DISKCOPY command. This command is described below.

2.5.1 The DISKCOPY Command

The DISKCOPY command copies the contents of a disk onto another disk. You can use this command to duplicate both the MS-DOS disk and a disk that contains your own files. DISKCOPY is the fastest way of copying a disk because it copies the entire disk in one operation, including MS-DOS system files if they exist.

The format of the DISKCOPY command is:

```
DISKCOPY [d:] [d:]
```

Drivel is the disk drive that contains the disk that you want to copy; drive2 is the disk drive that contains the blank or "destination" disk. The blank disk must be formatted prior to running DISKCOPY.

For example, if you want to make a copy of your MS-DOS disk which is in drive A:, type

DISKCOPY A: B:

MS-DOS responds:

Insert source diskette into drive A:
Insert formatted target diskette into drive B:
Press any key when ready

Make sure the MS-DOS disk is in drive A: and insert a blank, formatted disk in drive B:. Press any character key after you have done this and MS-DOS will begin copying the MS-DOS disk. After MS-DOS has copied the disk, MS-DOS displays:

Copy complete
Copy another (Y/N)?

Type Y (for Yes) if you wish to copy another disk with DISKCOPY. If you type N (for No), the default drive prompt is displayed.

You now have a duplicate copy of your MS-DOS disk in drive B:. This duplicate copy can be saved as your backup copy of the MS-DOS disk.

Figure 2 illustrates the DISKCOPY command:

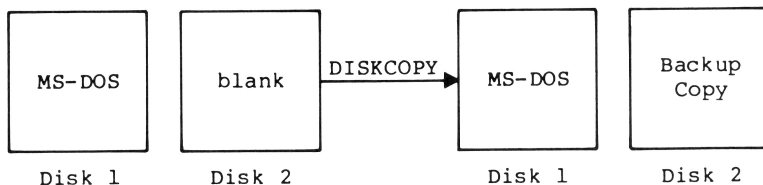


Figure 2. The DISKCOPY Command

Disks must be the same size and density to be copied with the DISKCOPY command. Refer to Chapter 5, "MS-DOS Commands," for more information on the DISKCOPY command.

NOTE

If either of the disks that you are using has defective tracks, DISKCOPY will not work. Use the COPY command to back up your disks in these cases. (COPY will skip over defective tracks.) Refer to Chapter 5, "MS-DOS Commands," for information on how to use COPY to back up your disks.

2.6 AUTOMATIC PROGRAM EXECUTION

If you want to run a specific program automatically each time you start MS-DOS, you can do so with Automatic Program Execution. For example, you may want to have MS-DOS display the names of your files each time you load MS-DOS.

When you start MS-DOS, the command processor searches for a file named AUTOEXEC.BAT on the MS-DOS disk. This file is a program that MS-DOS will run each time MS-DOS is started. Chapter 4, "Learning About Commands," tells you how to create an AUTOEXEC.BAT file.

2.7 FILES

2.7.1 What Is A File?

A file is a collection of related information. A file on your disk can be compared to a file folder in a desk drawer. For example, one file folder might contain the names and addresses of the employees who work in the office. You might name this file the Employee Master File. A file on your disk could also contain the names and addresses of employees in the office and could be named Employee Master File.

All programs, text, and data on your disk reside in files and each file has a unique name. You refer to files by their names. Chapter 3, "More About Files," tells you how to name your files.

You create a file each time you enter and save data or text at your terminal. Files are also created when you write and name programs and save them on your disks.

2.7.2 How MS-DOS Keeps Track Of Your Files

The names of files are kept in directories on a disk. These directories also contain information on the size of the files, their location on the disk, and the dates that they were created and updated. The directory you are working in is called your current or working directory.

An additional system area is called the File Allocation Table. It keeps track of the location of your files on the disk. It also allocates the free space on your disks so that you can create new files.

These two system areas, the directories and the File Allocation Table, enable MS-DOS to recognize and organize the files on your disks. The File Allocation Table is copied onto a new disk when you format it with the MS-DOS FORMAT command and one empty directory is created, called the root directory.

2.7.3 The DIR (Show Directory) Command

If you want to know what files are on your disk, you can use the DIR command. This command tells MS-DOS to display all the files in the current directory on the disk that is named. For example, if your MS-DOS disk is in drive A: and you want to see the listing for the current directory on that disk, type:

DIR A:

MS-DOS will respond with a directory listing of all the files in the current directory on your MS-DOS disk. The display should look similar to this:

Volume in drive A is DOS 2-0

Directory of A:\

COMMAND	COM	16276	10-29-81	11:48a
DEBUG	COM	11534	10-28-82	9:21a
CHKDSK	COM	6272	10-26-82	12:12p
SYS	COM	1400	10-29-82	6:30p
EDLIN	COM	4419	1-01-80	12:41a
RECOVER	COM	2281	10-29-82	5:37p
PRINT	COM	3899	10-27-82	12:19p
LINK	EXE	41856	8-31-82	1:14p
FORMAT	COM	5605	10-28-82	9:55a
EXEFIX	COM	1350	10-06-82	2:57p
SORT	EXE	1280	10-27-82	3:18p
MORE	COM	291	10-27-82	3:20p
FIND	EXE	5888	01-01-80	12:57a
CONFIG	SYS	33	10-18-82	5:02p
LOCATE	EXE	5888	10-27-82	12:53p
FC	EXE	10624	10-27-82	7:00p
LOGIN	COM	299	10-18-82	6:30p

20 File(s) 23040 bytes free

NOTE

Two MS-DOS system files, IO.SYS and MSDOS.SYS, are "hidden" files and will not appear when you issue the DIR command.

You can also get information about any file on your disk by typing DIR and a filename. For example, if you have created a file named MYFILE.TXT, the command:

DIR MYFILE.TXT

will give you a display of all the directory information (name of file, size of file, date last edited) for the file MYFILE.TXT.

For more information on the DIR command, refer to Chapter 5, "MS-DOS Commands."

2.7.4 The CHKDSK (Check Disk) Command

The MS-DOS command CHKDSK is used to check your disks for consistency and errors, much like a secretary proofreading a letter. CHKDSK analyzes the directories and the File Allocation Table on the disk that you specify. It then produces a status report of any inconsistencies, such as files which have a non-zero size in their directory but really have no data in them.

To check the disk in drive A:, type:

CHKDSK A:

MS-DOS will display a status report and any errors that it has found. An example of this display and more information on CHKDSK can be found in the description of the CHKDSK command in Chapter 5. You should run CHKDSK occasionally for each disk to ensure the integrity of your files.

2.8 HOW TO TURN THE SYSTEM OFF

There is no "logoff" command in MS-DOS. To end your terminal session, open the disk drive doors and remove the disks. Then, simply turn your terminal off in response to a default drive prompt. Refer to your hardware manufacturer's instructions for information on how to do this.

NOTE

Always remove your disks from the disk drives before you turn off your terminal and disk drives.

Summary of Commands in This Chapter

COMMAND	PURPOSE	SYNTAX
FORMAT	Formats disks for MS-DOS	FORMAT [d:]
DISKCOPY	Copies disks	DISKCOPY [drive1:][drive2:]
DIR	Lists directory information	DIR [d:][filename]
CHKDSK	Checks for errors on disk	CHKDSK [d:]

In the next chapter, you will learn more about MS-DOS files.

CHAPTER 3

MORE ABOUT FILES

How To Name Your Files

Wild Cards

The ? Wild Card

The * Wild Card

Illegal Filenames

How To Copy Your Files

How To Protect Your Files

Directories

Filenames And Paths

Pathnames

Pathing And External Commands

Pathing And Internal Commands

Displaying Your Working Directory

Creating A Directory

How To Change Your Working Directory

How To Remove A Directory

In Chapter 2, you learned that directories contain the names of your files. In this chapter, you will learn how to name and copy your files. You will also learn more about the MS-DOS hierarchical directory structure, which makes it easy for you to organize and locate your files.

3.1 HOW TO NAME YOUR FILES

The name of a typical MS-DOS file will look like this:

NEWFILE.EXE

The name of a file consists of two parts. The filename is NEWFILE and the filename extension is .EXE.

A filename can be from 1 to 8 characters long. The filename extension can be three or fewer characters. You can type any filename in small or capital letters and MS-DOS will translate these letters into uppercase characters.

In addition to the filename and the filename extension, the name of your file may include a drive designation. A drive designation tells MS-DOS to look on the disk in the designated drive to find the filename typed. For example, to find directory information about the file NEWFILE.EXE which is located on the disk in drive A: (and drive A: is NOT the default drive), type the following command:

DIR A:NEWFILE.EXE

Directory information about the file NEWFILE.EXE is now displayed on your screen.

If drive A: is the default drive, MS-DOS will search only the disk in drive A: for the filename NEWFILE and so the drive designation is not necessary. A drive designation is needed if you want to tell MS-DOS to look on the other drive to find a file.

Your filenames will probably be made up of letters and numbers, but other characters are allowed, too. Legal characters for filename extensions are the same as those for filenames. Here is a complete list of the characters you can use in filenames and extensions:

A-Z 0-9 \$ & #
% ' () - @
^ { } ~ ` !

All of the parts of a filename comprise a file specification. The term file specification (or filespec) will be used in this manual to indicate the following filename format:

```
[<drive designation:>]<filename>[<.filename extension>]
```

Remember that brackets indicate optional items. Angle brackets (<>) mean that you supply the text for the item. Note that the drive designation is not required unless you need to indicate to MS-DOS on which disk to search for a specific file. You do not have to give your filename a filename extension.

Examples of file specifications are:

```
B:MYPROG.COB
A:YOURPROG.EXT
A:NEWFILE.
TEXT
```

3.2 WILD CARDS

Two special characters (called wild cards) can be used in filenames and extensions: the asterisk (*) and the question mark (?). These special characters give you greater flexibility when using filenames in MS-DOS commands.

3.2.1 The ? Wild Card

A question mark (?) in a filename or filename extension indicates that any character can occupy that position. For example, the MS-DOS command:

```
DIR TEST?RUN.EXE
```

will list all directory entries on the default drive that have 8 characters, begin with TEST, have any next character, end with the letters RUN, and have a filename extension of .EXE. Here are some examples of files that might be listed by the above DIR command:

```
TEST1RUN.EXE
TEST2RUN.EXE
TEST6RUN.EXE
```

3.2.2 The * Wild Card

An asterisk (*) in a filename or filename extension indicates that any character can occupy that position or any of the remaining positions in the filename or extension. For example:

```
DIR TEST*.EXE
```

will list all directory entries on the default drive with filenames that begin with the characters TEST and have an extension of .EXE. Here are some examples of files that might be listed by the above DIR command:

```
TEST1RUN.EXE
TEST2RUN.EXE
TEST6RUN.EXE
TESTALL.EXE
```

The wild card designation *.* refers to all files on the disk. Note that this can be very powerful and destructive when used in MS-DOS commands. For example, the command DEL *.* deletes all files on the default drive, regardless of filename or extension.

Examples:

To list the directory entries for all files named NEWFILE on drive A: (regardless of their filename extensions), simply type:

```
DIR A:NEWFILE.*
```

To list the directory entries for all files with filename extensions of .TXT (regardless of their filenames) on the disk in drive B:, type:

```
DIR B:????????.TXT
```

This command is useful if, for example, you have given all your text programs a filename extension of .TXT. By using the DIR command with the wild card characters, you can obtain a listing of all your text files even if you do not remember all of their filenames.

3.3 ILLEGAL FILENAMES

MS-DOS treats some device names specially, and certain 3-letter names are reserved for the names of these devices. These 3-letter names cannot be used as filenames. They can be used as extensions. You must not name your files any of the following:

AUX	Used when referring to input from or output to an auxiliary device (such as a printer or disk drive).
CON	Used when referring to keyboard input or to output to the terminal console (screen).
PRN	Used when referring to the printer device.
NUL	Used when you do not want to create a particular file, but the command requires an input or output filename.

Even if you add device designations or filename extensions to these filenames, they remain associated with the devices listed above. For example, A:CON.XXX still refers to the console and is not the name of a disk file.

3.4 HOW TO COPY YOUR FILES

Just as with paper files, you often need more than one copy of a disk file. The COPY command allows you to copy one or more files to another disk. You can also give the copy a different name if you specify the new name in the COPY command.

The COPY command can also make copies of files on the same disk. In this case, you must supply MS-DOS with a different filename or you will overwrite the file. You cannot make a copy of a file on the same disk unless you specify a different filename for the new copy.

The format of the COPY command is:

```
COPY filespec [filespec]
```

For example:

```
COPY A:MYFILE.TXT B:MYFILE.TXT
```

will copy the file MYFILE.TXT on the disk in drive A: to a file named MYFILE.TXT on the disk in drive B:. A duplicate copy of MYFILE.TXT now exists.

Figure 3 illustrates how to copy files to another disk:

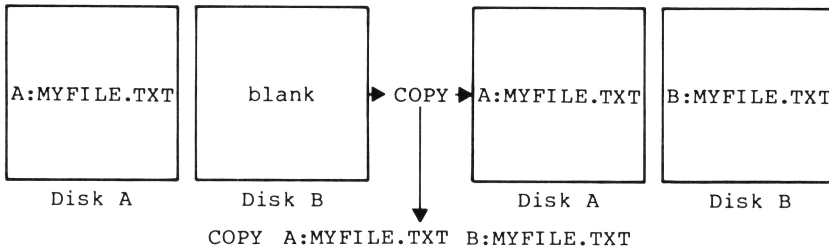


Figure 3. Copying Files to Another Disk

If you want to duplicate the file named MYFILE.TXT on the same disk, type:

```
COPY A:MYFILE.TXT A:NEWNAME.TXT
```

You now have two copies of your file on disk A--one named MYFILE.TXT and the other named NEWNAME.TXT. The following figure illustrates this example:

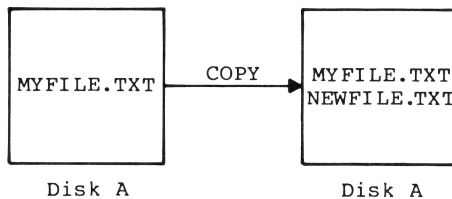


Figure 4. Copying Files on the Same Disk

You can also copy all files on a disk to another disk (i.e., make a backup copy) with the COPY command. Refer to Chapter 5, "MS-DOS Commands," for more information on this process.

3.5 HOW TO PROTECT YOUR FILES

MS-DOS is a powerful and useful tool in processing your personal and business information. As with any information system, inadvertent errors may occur and information may be misused. If you are processing information that cannot be replaced or requires a high level of security, you should take steps to ensure that your data and programs are protected from accidental or unauthorized use, modification, or destruction. Simple measures you can take--such as removing your disks when they are not in use, keeping backup copies of valuable information, and installing your equipment in a secure facility--can help you maintain the integrity of the information in your files.

3.6 DIRECTORIES

As you learned in Chapter 2, the names of your files are kept in a directory on each disk. The directory also contains information on the size of the files, their locations on the disk, and the dates that they were created and updated.

When there are multiple users on your computer, or when you are working on several different projects, the number of files in the directory can become large and unwieldy. You may want your own files kept separate from a co-worker's; or, you may want to organize your programs into categories that are convenient for you.

In an office, you can separate files by putting them in different filing cabinets; in effect, creating different directories of information. MS-DOS allows you to organize the files on your disks into directories. Directories are a way of dividing your files into convenient groups of files. For example, you may want all of your accounting programs in one directory and text files in another. Any one directory can contain any reasonable number of files, and it may also contain other directories (referred to as subdirectories). This method of organizing your files is called a hierarchical directory structure.

A hierarchical directory structure can be thought of as a "tree" structure: directories are branches of the tree and files are the leaves, except that the "tree" grows downward; that is, the "root" is at the top. The root is the first level in the directory structure. It is the directory that

is automatically created when you format a disk and start putting files in it. You can create additional directories and subdirectories by following the instructions in Chapter 4, "Learning About Commands."

The tree or file structure grows as you create new directories for groups of files or for other people on the system. Within each new directory, files can be added, or new subdirectories can be created.

It is possible for you to "travel" around this tree; for instance, it is possible to find any file in the system by starting at the root and traveling down any of the branches to the desired file. Conversely, you can start where you are within the file system and travel towards the root.

The filenames discussed earlier in this chapter are relative to your current directory and do not apply system-wide. Thus, when you turn on your computer, you are "in" your directory. Unless you take special action when you create a file, the new file is created in the directory in which you are now working. Users can have files of the same name that are unrelated because each is in a different directory.

Figure 5 illustrates a typical hierarchical directory structure:

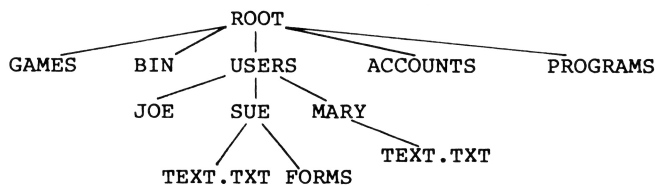


Figure 5. A Sample Hierarchical Directory Structure

The ROOT directory is the first level in the directory structure. You can create subdirectories from the ROOT by using the MKDIR command (refer to Chapter 5, "MS-DOS Commands," for information on MKDIR). In this example, five subdirectories of ROOT have been created. These include:

1. A directory of games, named GAMES
2. A directory of all external commands, named BIN (refer to Chapter 4, "Learning About Commands," for more information on the IN directory)
3. A USER directory containing separate subdirectories for all users of the system
4. A directory containing accounting information, named ACCOUNTS
5. A directory of programs, named PROGRAMS

Joe, Sue, and Mary each have their own directories which are subdirectories of the USER directory. Sue has a subdirectory under the \USER\SUE directory named FORMS. Sue and Mary have files in their directories, each named TEXT.TXT. Notice that Mary's text file is unrelated to Sue's.

This organization of files and directories is not important if you only work with files in your own directory; but if you work with someone else or on several projects at one time, the hierarchical directory structure becomes extremely useful. For example, you could get a list of the files in Sue's FORMS directory by typing:

```
DIR \USER\SUE\FORMS
```

Note that the backward slash mark (\) is used to separate directories from other directories and files.

To find out what files Mary has in her directory, you could type:

```
DIR \USER\MARY
```

3.7 FILENAMES AND PATHS

When you use hierarchical directories, you must tell MS-DOS where the files are located in the directory structure. Both Mary and Sue, for example, have files named TEXT.TXT. Each will have to tell MS-DOS in which directory her file resides if she wants to access it. This is done by giving MS-DOS a pathname to the file.

3.7.1 Pathnames

A simple filename is a sequence of characters that can optionally be preceded by a drive designation and followed by an extension. A pathname is a sequence of directory names followed by a simple filename, each separated from the previous one by a backward slash (\).

The syntax of pathnames is:

```
[<d>:][<directory>]\[<directory...>]\[<filename>]
```

If a pathname begins with a slash, MS-DOS searches for the file beginning at the root (or top) of the tree. Otherwise, MS-DOS begins at the user's current directory, known as the working directory, and searches downward from there. The pathname of Sue's TEXT.TXT file is \USER\SUE\TEXT.TXT.

When you are in your working directory, a filename and its corresponding pathname may be used interchangeably. Some sample names are:

\	Indicates the root directory.
\PROGRAMS	Sample directory under the root directory containing program files.
\USER\MARY\FORMS\1A	A typical full pathname. This one happens to be a file named 1A in the directory named FORMS belonging to the USER named MARY.

USER\SUE A relative pathname; it names the file or directory SUE in subdirectory USER of the working directory. If the working directory is the root directory (\), it names \USER\SUE.

TEXT.TXT Name of a file or directory in the working directory.

MS-DOS provides special shorthand notations for the working directory and the parent directory (one level up) of the working directory:

- . MS-DOS uses this shorthand notation to indicate the name of the working directory in all hierarchical directory listings. MS-DOS automatically creates this entry when a directory is made.
- .. The shorthand name of the working directory's parent directory. If you type:

DIR ..

then MS-DOS will list the files in the parent directory of your working directory.

If you type:

DIR ..\..

then MS-DOS will list the files in the parent's PARENT directory.

3.7.2 Pathing And External Commands

External commands reside on disks as program files. They must be read from the disk before they execute. (For more information on external commands, refer to Chapter 4, "Learning About Commands.")

When you are working with more than one directory, it is convenient to put all MS-DOS external commands into a separate directory so they do not clutter your other directories. When you issue an external command to MS-DOS, MS-DOS immediately checks your working directory to find that command. You must tell MS-DOS in which directory these external commands reside. This is done with the PATH command.

For example, if you are in a working directory named

\BIN\PROG, and all MS-DOS external commands are in \BIN, you must tell MS-DOS to choose the \BIN path to find the FORMAT command. The command:

PATH \BIN

tells MS-DOS to search in your working directory and the \BIN directory for all commands. You only have to specify this path once to MS-DOS during your terminal session. MS-DOS will now search in \BIN for the external commands. If you want to know what the current path is, type the word PATH and the current value of PATH will be printed.

For more information on the MS-DOS command PATH, refer to Chapter 5, "MS-DOS Commands."

3.7.3 Pathing And Internal Commands

Internal commands are the simplest, most commonly used commands. They execute immediately because they are incorporated into the command processor. (For more information on internal commands, refer to Chapter 4, "Learning About Commands.")

Some internal commands can use paths. The four commands, COPY, DIR, DEL, and TYPE have greater flexibility when you specify a pathname after the command.

The syntax of these four commands is shown below:

COPY <pathname pathname>

If the second pathname to COPY is a directory, all files are copied into that directory.

DEL <pathname>

If the pathname is a directory, all the files in that directory are deleted. Note: The prompt "Are you sure (Y/N)?" will be displayed if you try to delete a path. Type Y to complete the command, or type N for the command to abort.

DIR <pathname>

Displays the directory for a specific path.

TYPE <pathname>

You must specify a file in a path for this command. MS-DOS will display the file on your screen in response to the TYPE pathname command.

3.7.4 Displaying Your Working Directory

All commands are executed while you are in your working directory. You can find out the name of the directory you are in by issuing the MS-DOS command CHDIR (Change Directory) with no options. For example, if your current directory is \USER\JOE, when you type:

```
CHDIR<RETURN>
```

you will see:

```
A:\USER\JOE
```

This is your current drive designation plus the working directory (\USER\JOE).

If you now want to see what is in the \USER\JOE directory, you can issue the MS-DOS command DIR. The following is an example of the display you might receive from the DIR command for a subdirectory:

```
Volume in drive A has no ID
Directory of A:\USER\JOE

.                <DIR>          8-09-82    10:09a
..               <DIR>          8-09-82    10:09a
TEXT             <DIR>          8-09-82    10:09a
FILE1.COM        5243          8-04-82    9:30a
4 File(s)        8376320 bytes free
```

A volume ID for this disk was not assigned when the disk was formatted. Note that MS-DOS lists both files and directories in this output. As you can see, Joe has another directory in this tree structure named TEXT. The '.' indicates the working directory \USER\JOE, and the '..' is the shorthand notation for the parent directory \USER. FILE1.COM is a file in the \USER\JOE directory. All of these directories and files reside on the disk in drive A:.

Because files and directories are listed together (see previous display), MS-DOS does not allow you to give a subdirectory the same name as a file in that directory. For example, if you have a path \BIN\USER\JOE where JOE is a subdirectory, you cannot create a file in the USER directory named JOE.

3.7.5 Creating A Directory

To create a subdirectory in your working directory, use the MKDIR (Make Directory) command. For example, to create a new directory named NEWDIR under your working directory, simply type:

MKDIR NEWDIR

After this command has been executed by MS-DOS, a new directory will exist in your tree structure under your working directory. You can also make directories anywhere in the tree structure by specifying MKDIR and then a pathname. MS-DOS will automatically create the . and .. entries in the new directory.

To put files in the new directory, use the MS-DOS line editor, EDLIN. Chapter 7, "The Line Editor (EDLIN)," describes how to use EDLIN to create and save files.

3.7.6 How To Change Your Working Directory

Changing from your working directory to another directory is very easy in MS-DOS. Simply issue the CHDIR (Change Directory) command and supply a pathname. For example:

```
A>CHDIR \USER
```

changes the working directory from \USER\JOE to \USER. You can specify any pathname after the command to "travel" to different branches and leaves of the directory tree. The command "CHDIR .." will always put you in the parent directory of your working directory.

3.7.7 How To Remove A Directory

To delete a directory in the tree structure, use the MS-DOS RMDIR (Remove Directory) command. For example, to remove the directory NEWDIR from the working directory, type:

```
RMDIR NEWDIR
```

Note that the directory NEWDIR must be empty except for the . and .. entries before it can be removed; this will prevent you from accidentally deleting files and directories. You can remove any directory by specifying its pathname. To remove the \BIN\USER\JOE directory, make sure that it has only the . and .. entries, then type:

```
RMDIR \BIN\USER\JOE
```

To remove all the files in a directory (except for the . and .. entries), type DEL and then the pathname of the directory. For example, to delete all files in the \BIN\USER\SUE directory, type:

```
DEL \BIN\USER\SUE
```

You cannot delete the . and .. entries. They are created by MS-DOS as part of the hierarchical directory structure.

Summary of Commands in This Chapter

COMMAND	PURPOSE	SYNTAX
COPY	Copies files	COPY <filespec> [<filespec>]
PATH	Sets MS-DOS search path	PATH [pathname]
CHDIR	Displays working directory; changes directories	CHDIR [pathname]
MKDIR	Makes a new directory	MKDIR [pathname]
RMDIR	Removes a directory	RMDIR [pathname]

In the next chapter, you will learn about MS-DOS commands.

CHAPTER 4

LEARNING ABOUT COMMANDS

Introduction

Types Of MS-DOS Commands

Command Options

Information Common To All MS-DOS Commands

Batch Processing

The AUTOEXEC.BAT File

How to Create An AUTOEXEC.BAT File

Creating A .BAT File With Replaceable Parameters

Executing A .BAT File

Input And Output

Redirecting Your Output

Filters

Command Piping

4.1 INTRODUCTION

Commands are a way of communicating with the computer. By entering MS-DOS commands at your terminal, you can ask the system to perform useful tasks. There are MS-DOS commands that:

Compare, copy, display, delete, and rename files.

Copy and format disks.

Execute system programs such as EDLIN, as well as your own programs.

Analyze and list directories.

Enter date, time, and remarks.

Set various printer and screen options.

Copy MS-DOS system files to another disk.

Request MS-DOS to wait for a specific period of time.

4.2 TYPES OF MS-DOS COMMANDS

There are two types of MS-DOS commands:

Internal commands

External commands

Internal commands are the simplest, most commonly used commands. You cannot see these commands when you do a directory listing on your MS-DOS disk; they are part of the command processor. When you type these commands, they execute immediately. The following internal commands are described in Chapter 5:

BREAK	DEL (ERASE)	MKDIR (MD)	SET
CHDIR (CD)	DIR	PATH	SHIFT
CLS	ECHO	PAUSE	TIME
COPY	EXIT	PROMPT	TYPE
CTTY	FOR	REM	VER
DATE	GOTO	REN (RENAME)	VERIFY
	IF	RMDIR (RD)	VOL

External commands reside on disks as program files. They must be read from disk before they can execute. If the disk containing the command is not in the drive, MS-DOS will not be able to find and execute the command.

Any filename with a filename extension of .COM, .EXE or .BAT is considered an external command. For example, programs such as FORMAT.COM and COMP.COM are external commands. Because all external commands reside on disk, you can create commands and add them to the system. Programs that you create with most languages (including assembly language) will be .EXE (executable) files.

When you enter an external command, do not include its filename extension. The following external commands are described in Chapter 5:

BACKUP	MORE
CHKDSK	PRINT
DISKCOPY	RECOVER
FIND	RESTORE
FORMAT	SORT
EXE2BIN	SYS

4.3 COMMAND OPTIONS

Options can be included in your MS-DOS commands to specify additional information to the system. If you do not include some options, MS-DOS provides a default value. Refer to individual command descriptions in Chapter 5 for the default values.

The following is the format of all MS-DOS commands:

Command [options...]

where [options...] represents the following:

d:	Refers to disk drive designation.
filename	Refers to any valid name for a disk file, including an optional filename extension. The filename option does <u>not</u> refer to a device or to a disk drive designation.
.ext	Refers to an optional filename extension consisting of a period and 1-3 characters. When used, filename extensions immediately follow filenames.

filespec Refers to an optional drive designation, a filename, and an optional three letter filename extension in the following format:

[<d:>]<filename>[<.ext>]

pathname Refers to a pathname or filename in the following format:

[<directory>]\[<directory...>]\[<filename>]

switches Switches are options that control MS-DOS commands. They are preceded by a forward slash (for example, /P).

arguments Provide more information to MS-DOS commands. You usually choose between arguments; for example, ON or OFF.

4.4 INFORMATION COMMON TO ALL MS-DOS COMMANDS

The following information applies to all MS-DOS commands:

1. Commands are usually followed by one or more options.
2. Commands and options may be entered in uppercase or lowercase, or a combination of keys.
3. Commands and options must be separated by delimiters. Because they are easiest, you will usually use the space and comma as index delimiters. For example:

```
DEL MYFILE.OLD NEWFILE.TXT  
RENAME,THISFILE THATFILE
```

You can also use the semicolon (;), the equal sign (=), or the tab key as delimiters in MS-DOS commands.

In this manual, we will use a space as the delimiter in commands.

4. Do not separate a file specification with delimiters, since the colon and the period already serve as delimiters.
5. When instructions say "Press any key," you can press any alpha (A-Z) or numeric (0-9) key.
6. You must include the filename extension when referring to a file that already has a filename extension.

7. You can abort commands when they are running by pressing <CONTROL-C>.
8. Commands take effect only after you have pressed the <RETURN> key.
9. Wild cards (global filename characters) and device names (for example, PRN or CON) are not allowed in the names of any commands.
10. When commands produce a large amount of output on the screen, the display will automatically scroll to the next screen. You can press <CONTROL-S> to suspend the display. Press any key to resume the display.
11. MS-DOS editing and function keys can be used when entering commands.
Refer to Chapter 6, "MS-DOS Editing and Function Keys," for a complete description of these keys.
12. The prompt from the command processor is the default drive designation plus a greater-than sign; for example, A>.
13. Disk drives will be referred to as source drives and destination drives. A source drive is the drive you will be transferring information from. A destination drive is the drive you will be transferring information to.

4.5 BATCH PROCESSING

Often you may find yourself typing the same sequence of commands over and over to perform some commonly used task. With MS-DOS, you can put the command sequence into a special file called a batch file, and execute the entire sequence simply by typing the name of the batch file. "Batches" of your commands in such files are processed as if they were typed at a terminal. Each batch file must be named with the .BAT extension, and is executed by typing the filename without its extension.

You can create a batch file by using the Line Editor (EDLIN) or by typing the COPY command. Refer to the "How to Create an AUTOEXEC.BAT File" section later in this chapter for more information on using the COPY command to create a batch file.

Two MS-DOS commands are available for use expressly in batch files: REM and PAUSE. REM permits you to include remarks and comments in your batch files without these remarks being executed as commands. PAUSE prompts you with an optional message and permits you to either continue or abort the batch process at a given point. REM and PAUSE are described in detail in Chapter 5.

Batch processing is useful if you want to execute several MS-DOS commands with one batch command, such as when you format and check a new disk. For example, a batch file for this purpose might look like this:

```
1: REM This is a file to check new disks
2: REM It is named NEWDISK.BAT
3: PAUSE Insert new disk in drive B:
4: FORMAT B:
5: DIR B:
6: CHKDSK B:
```

To execute this .BAT file, simply type the filename without the .BAT extension:

NEWDISK

The result is the same as if each of the lines in the .BAT file was entered at the terminal as individual commands.

Figure 6 illustrates the three steps used to write, save, and execute an MS-DOS batch file:

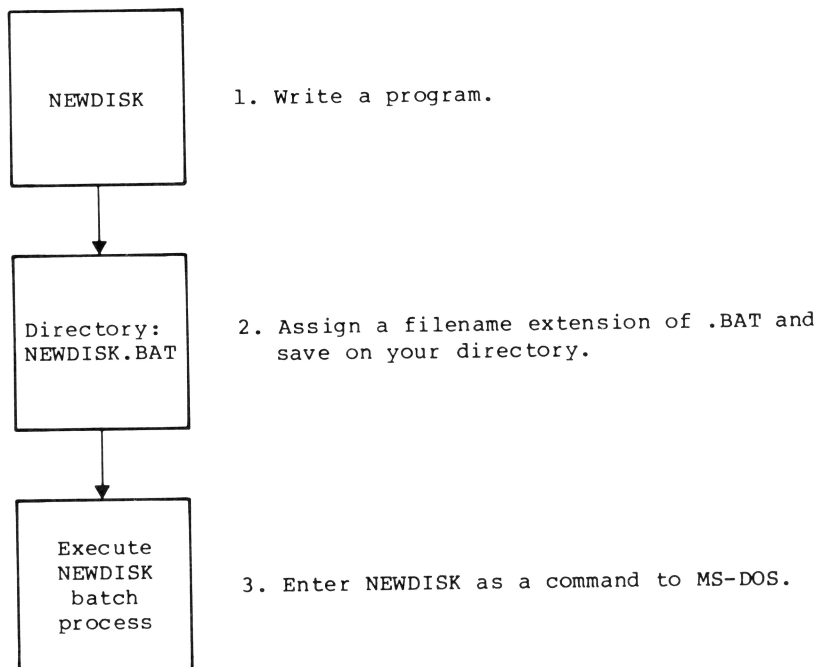


Figure 6. MS-DOS Batch File Steps

The following list contains information that you should read before you execute a batch process with MS-DOS:

1. Do not enter the filename BATCH (unless the name of the file you want to execute is BATCH.BAT).
2. Only the filename should be entered to execute the batch file. Do not enter the filename extension.
3. The commands in the file named <filename>.BAT are executed.
4. If you press <CONTROL-C> while in batch mode, this prompt appears:

Terminate batch job (Y/N)?

If you press Y, the remainder of the commands in the batch file are ignored and the system prompt appears.

If you press N, only the current command ends and batch processing continues with the next command in the file.

5. If you remove the disk containing a batch file being executed, MS-DOS prompts you to insert it again before the next command can be read.
6. The last command in a batch file may be the name of another batch file. This allows you to call one batch file from another when the first is finished.

4.6 THE AUTOEXEC.BAT FILE

As discussed in Chapter 2, an AUTOEXEC.BAT file allows you to automatically execute programs when you start MS-DOS. Automatic Program Execution is useful when you want to run a specific package (for example, Microsoft Multiplan(tm)) under MS-DOS, and when you want MS-DOS to execute a batch program automatically each time you start the system. You can avoid loading two separate disks to perform either of these tasks by using an AUTOEXEC.BAT file:

When you start MS-DOS, the command processor searches the MS-DOS disk for a file named AUTOEXEC.BAT. The AUTOEXEC.BAT file is a batch file that is automatically executed each time you start the system.

If MS-DOS finds the AUTOEXEC.BAT file, the file is immediately executed by the command processor and the date and time prompts are bypassed.

If MS-DOS does not find an AUTOEXEC.BAT file when you first

load the MS-DOS disk, then the date and time prompts will be issued. Figure 7 illustrates how MS-DOS uses the AUTOEXEC.BAT file:

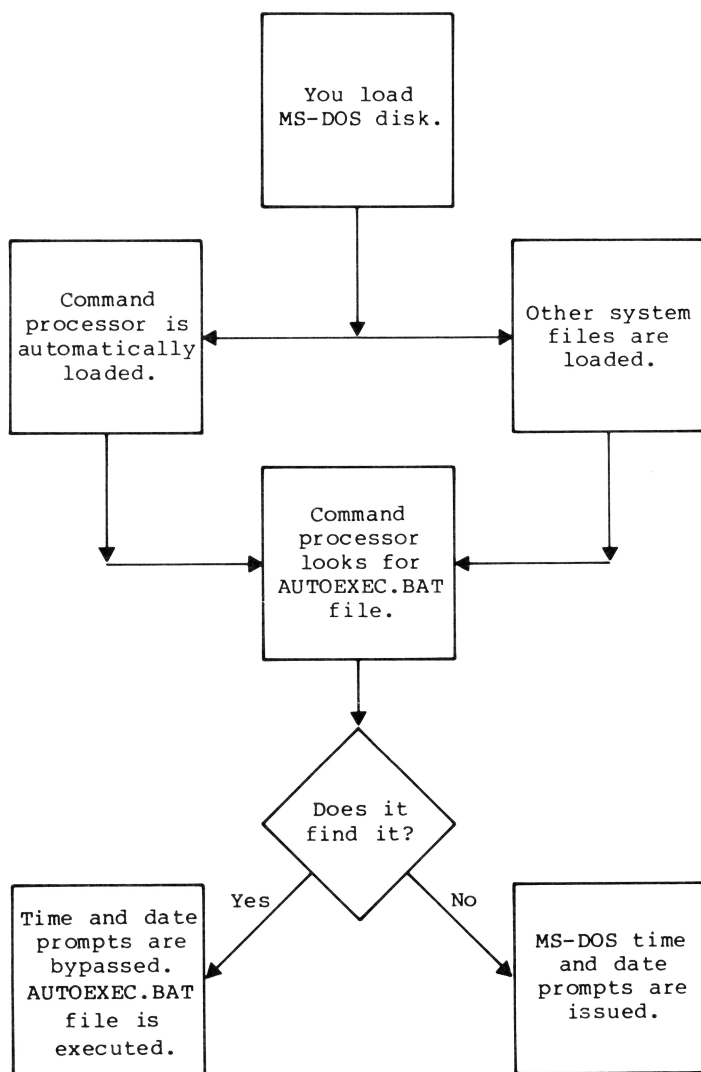


Figure 7. How MS-DOS Uses the AUTOEXEC.BAT File

4.6.1 How To Create An AUTOEXEC.BAT File

If, for example, you wanted to automatically load BASIC and run a program called MENU each time you started MS-DOS, you could create an AUTOEXEC.BAT file as follows:

1. Type:

```
COPY CON AUTOEXEC.BAT
```

This statement tells MS-DOS to copy the information from the console (keyboard) into the AUTOEXEC.BAT file. Note that the AUTOEXEC.BAT file must be created in the root directory of your MS-DOS disk.

2. Now type:

```
BASIC MENU
```

This statement goes into the AUTOEXEC.BAT file. It tells MS-DOS to load BASIC and run the MENU program whenever MS-DOS is started.

3. Press <CONTROL-Z>; then press the <RETURN> key to put the command BASIC MENU in the AUTOEXEC.BAT file.
4. The MENU program will now run automatically whenever you start MS-DOS.

To run your own BASIC program, enter the name of your program in place of MENU in the second line of the example. You can enter any MS-DOS command or series of commands in the AUTOEXEC.BAT file.

NOTE

Remember that if you use an AUTOEXEC.BAT file, MS-DOS will not prompt you for a current date and time unless you include the DATE and TIME commands in the AUTOEXEC.BAT file. It is strongly recommended that you include these two commands in your AUTOEXEC.BAT file, since MS-DOS uses this information to keep your directory current.

4.7 CREATING A .BAT FILE WITH REPLACEABLE PARAMETERS

There may be times when you want to create an application program and run it with different sets of data. These data may be stored in various MS-DOS files.

When used in MS-DOS commands, a parameter is an option that you define. With MS-DOS, you can create a batch (.BAT) file with dummy (replaceable) parameters. These parameters, named %0-%9, can be replaced by values supplied when the batch file executes.

For example, when you type the command line COPY CON MYFILE.BAT, the next lines you type are copied from the console to a file named MYFILE.BAT on the default drive:

```
A>COPY CON MYFILE.BAT
COPY %1.MAC %2.MAC
TYPE %2.PRN
TYPE %0.BAT
```

Now, press <CONTROL-Z> and then press <RETURN>. MS-DOS responds with this message:

```
1 File(s) copied
A>_
```

The file MYFILE.BAT, which consists of three commands, now resides on the disk in the default drive.

The dummy parameters %1 and %2 are replaced sequentially by the parameters you supply when you execute the file. The dummy parameter %0 is always replaced by the drive designator, if specified, and the filename of the batch file (for example, MYFILE).

NOTES:

1. Up to 10 dummy parameters (%0-%9) can be specified. Refer to the MS-DOS command SHIFT in Chapter 5 if you wish to specify more than 10 parameters.
2. If you use the percent sign as part of a filename within a batch file, you must type it twice. For example, to specify the file ABC%.EXE, you must type it as ABC%%.EXE in the batch file.

4.7.1 Executing A .BAT File

To execute the batch file MYFILE.BAT and to specify the parameters that will replace the dummy parameters, you must enter the batch filename (without its extension) followed by the parameters you want MS-DOS to substitute for %1, %2, etc.

Remember that the file MYFILE.BAT consists of 3 lines:

```
COPY %1.MAC %2.MAC
TYPE %2.PRN
TYPE %0.BAT
```

To execute the MYFILE batch process, type:

```
MYFILE A:PROG1 B:PROG2
```

MYFILE is substituted for %0, A:PROG1 for %1, and B:PROG2 for %2.

The result is the same as if you had typed each of the commands in MYFILE with their parameters, as follows:

```
COPY A:PROG1.MAC B:PROG2.MAC
TYPE B:PROG2.PRN
TYPE MYFILE.BAT
```

The following table illustrates how MS-DOS replaces each of the above parameters:

BATCH FILENAME	PARAMETER1 (%0) (MYFILE)	PARAMETER2 (%1) (PROG1)	PARAMETER3 (%2) (PROG2)
MYFILE	MYFILE.BAT	PROG1.MAC	PROG2.MAC PROG2.PRN

Remember that the dummy parameter %0 is always replaced by the drive designator (if specified) and the filename of the batch file.

4.8 INPUT AND OUTPUT

MS-DOS always assumes that input comes from the keyboard and output goes to the terminal screen. However, the flow of command input and output can be redirected. Input can come from a file rather than a terminal keyboard, and output can go to a file or to a line printer instead of to the terminal screen. In addition, "pipes" can be created that allow output from one command to become the input to another. Redirection and pipes are discussed in the next sections.

4.8.1 Redirecting Your Output

Most commands produce output that is sent to your terminal screen. You can send this information to a file by using a greater-than sign (>) in your command. For example, the command:

```
DIR
```

displays a directory listing of the disk in the default drive on the terminal screen. The same command can send this output to a file named MYFILES by designating the output file on the command line:

```
DIR >MYFILES
```

If the file MYFILES does not already exist, MS-DOS creates it and stores your directory listing in it. If MYFILES already exists, MS-DOS overwrites what is in the file with the new data.

If you want to append your directory or a file to another file (instead of replacing the entire file), two greater-than signs (>>) can be used to tell MS-DOS to append the output of the command (such as a directory listing) to the end of a specified file. The command:

```
DIR >>MYFILES
```

appends your directory listing to a currently existing file named MYFILES. If MYFILES does not exist, it is created.

It is often useful to have input for a command come from a file rather than from a terminal. This is possible in MS-DOS by using a less-than sign (<) in your command. For example, the command:

```
SORT <NAMES >LIST1
```

sorts the file NAMES and sends the sorted output to a file named LIST1.

4.8.2 Filters

A filter is a command that reads your input, transforms it in some way, and then outputs it, usually to your terminal or to a file. In this way, the data is said to have been "filtered" by the program. Since filters can be put together in many different ways, a few filters can take the place of a large number of specific commands.

MS-DOS filters include FIND, MORE, and SORT. Their

functions are described below:

FIND	Searches for a constant string of text in a file
MORE	Takes standard terminal output and displays it, one screen at a time
SORT	Sorts text

You can see how these filters are used in the next section.

4.8.3 Command Piping

If you want to give more than one command to the system at a time, you can "pipe" commands to MS-DOS. For example, you may occasionally need to have the output of one program sent as the input to another program. A typical case would be a program that produces output in columns. It could be desirable to have this columnar output sorted.

Piping is done by separating commands with the pipe separator, which is the vertical bar symbol (|). For example, the command:

```
DIR | SORT
```

will give you an alphabetically sorted listing of your directory. The vertical bar causes all output generated by the left side of the bar to be sent to the right side of the bar for processing.

Piping can also be used when you want to output to a file. If you want your directory sorted and sent to a new file (for example, DIREC.FIL), you could type:

```
DIR | SORT >DIREC.FIL
```

MS-DOS will create a file named DIREC.FIL on your default drive. DIREC.FIL contains a sorted listing of the directory on the default drive, since no other drive was specified in the command. To specify a drive other than the default drive, type:

```
DIR | SORT >B:DIREC.FIL
```

This sends the sorted data to a file named DIREC.FIL on drive B:.

A pipeline may consist of more than two commands. For example:

```
DIR | SORT | MORE
```


will sort your directory, show it to you one screen at a time, and put --MORE-- at the bottom of your screen when there is more output to be seen.

You will find many uses for piping commands and filters.

Summary of Commands in This Chapter

COMMAND	PURPOSE	SYNTAX
REM	Adds comment line for batch files	REM [remark]
PAUSE	Suspends execution of a batch file	PAUSE [comment]
FIND	Searches for string of text	FIND string [filename]
MORE	Pages through a file 23 lines at a time	MORE
SORT	Sorts text	SORT

You will find more information on using these filters in the next chapter, "MS-DOS Commands".

CHAPTER 5

COMMANDS

Command Formats

Commands

Batch Processing Commands

5.1 COMMAND FORMATS

The following notation indicates how you should format MS-DOS commands:

1. You must enter any words shown in capital letters. These words are called keywords and must be entered exactly as shown. You can enter these keywords in any combination of upper/lowercase; MS-DOS will convert all keywords to uppercase.
2. You supply the text for any items enclosed in angle brackets (< >). For example, you should enter the name of your file when <filename> is shown in the format.
3. Items in square brackets ([]) are optional. If you wish to include optional information, do not include the square brackets, only the information within the brackets.
4. An ellipsis (...) indicates that you may repeat an item as many times as you want.
5. You must include all punctuation where shown (with the exception of square brackets), such as commas, equal signs, question marks, colons, or slashes.

5.2 COMMANDS

NOTE

Users of single-drive systems should refer to Appendix A for the additional procedures required when executing many of the following commands.

The following MS-DOS commands are described in this chapter. Note that synonyms for commands are enclosed in parentheses.

BACKUP	Backs up files from a fixed disk
BREAK	Sets CONTROL-C check
CHDIR	Changes directories; prints working directory (CD)
CHKDSK	Scans the directory of the default or designated drive and checks for consistency
CLS	Clears screen
COPY	Copies file(s) specified
CTTY	Changes console TTY
DATE	Displays and sets date
DEL	Deletes file(s) specified (ERASE)
DIR	Lists requested directory entries
DISKCOPY	Copies disks
EXE2BIN	Converts executable files to binary format
EXIT	Exits command and returns to lower level
FIND	Searches for a constant string of text
FORMAT	Formats a disk to receive MS-DOS files
MKDIR	Makes a directory (MD)
MORE	Displays output one screen at a time
PATH	Sets a command search path
PRINT	Background print feature
PROMPT	Designates command prompt
RECOVER	Recovers a bad disk
REM	Displays a comment in a batch file
REN	Renames first file as second file (RENAME)
RESTORE	Restores files
RMDIR	Removes a directory (RD)
SET	Sets one string value to another
SORT	Sorts data alphabetically, forward or backward

SYS	Transfers MS-DOS system files from drive A: to the drive specified
TIME	Displays and sets time
TYPE	Displays the contents of file specified
VER	Prints MS-DOS version number
VERIFY	Verifies writes to disk
VOL	Prints volume identification number

Batch Commands (Command extensions)

ECHO	Turns batch file echo feature on/off
FOR	Batch command extension
GOTO	Batch command extension
IF	Batch command extension
PAUSE	Pauses for input in a batch file
SHIFT	Increases number of replaceable parameters in batch process

NAME	TYPE
BACKUP	External

PURPOSE

Backs up one or more files from a fixed disk to floppy disk.

SYNTAX

BACKUP [<d:>][<path>][<filespec>] d: [/S][/M]
[/A][/P] [/D:<date>][/T:<time>][/L:fname]

COMMENTS

The first parameter you specify is the fixed disk file(s) to back up. The second parameter is the backup disk drive. Unless otherwise specified, the old files on a backup floppy disk are erased before new files are added to it.

This backup program and the one supplied by IBM(r) are compatible. File and disk formats are the same as those used by the IBM backup program unless you set the /P switch or the /T switches described below. The files that are backed up with the /P switch are not guaranteed to be restorable by the IBM restore program.

The following switches are used with BACKUP:

- /S Back up subdirectories also.
- /M Only back up those files which have changed since the last backup.
- /A Add the files to be backed up to those already on the backup floppy disk. Do not erase old files on the floppy disk.
- /P Pack as many files as possible onto each floppy disk. Create a subdirectory on the floppy disk if that is the only way to fill the floppy disk. (WARNING: IBM Backup/Restore compatibility may be lost if this switch is used.)
- /D Only back up those files which were last modified at or after a certain date.
- /T Only back up those files which were last modified at or after a certain time.
- /L Make a backup log entry in the file specified. If no filename was given, the file BACKUP.LOG will be placed in the root directory of the files being backed up. The first line of the entry in the file will contain: [date time] where date and time are the backup dates and times. Each subsequent line in the entry will

correspond to one of the files that was backed up. These lines will consist of the file name and the number of the floppy disk that contains the file. This information can be used when you need to restore a particular file from a floppy disk. You will know exactly which disk to give RESTORE so that it will not have to search for files. If the backup log file already exists, the current entry is appended to the file.

The backup program sets the ERRORLEVEL in the following manner:

- 0 Normal completion
- 1 No files were found to back up
- 3 Terminated by user
- 4 Terminated due to error

NAME	TYPE
BREAK	Internal

PURPOSE
Sets CONTROL-C check.

SYNTAX
BREAK [ON|OFF]

COMMENTS
If you are running an application program that uses CONTROL-C function keys, you will want to turn off the MS-DOS CONTROL-C function so that when you press <CONTROL-C> you affect your program and not the operating system. Specify BREAK OFF to turn off CONTROL-C and BREAK ON when you have finished running your application program and are using MS-DOS.

If you do not specify ON or OFF, MS-DOS displays the current setting of BREAK.

NAME	TYPE
CHDIR (CHANGE DIRECTORY)	Internal

SYNONYM
CD

PURPOSE
Changes directory to a different path;
displays current (working) directory.

SYNTAX
CHDIR [pathname]

COMMENTS

If your working directory is \BIN\USER\JOE and you want to change your path to another directory (such as \BIN\USER\JOE\FORMS), type:

```
CHDIR \BIN\USER\JOE\FORMS
```

and MS-DOS will put you in the new directory. A shorthand notation is also available with this command:

```
CHDIR ..
```

This command will always put you in the parent directory of your working directory.

CHDIR used without a pathname displays your working directory. If your working directory is \BIN\USER\JOE on drive B:, and you type CHDIR <RETURN>, MS-DOS will display:

```
B: \BIN\USER\JOE
```

This command is useful if you forget the name of your working directory.

NAME	TYPE
CHKDSK (CHECK DISK)	External

PURPOSE
Scans the directory of the specified disk drive and checks it for consistency.

SYNTAX
CHKDSK [d:] <filespec> [/F] [/V]

COMMENTS
CHKDSK should be run occasionally on each disk to check for errors in the directory. If any errors are found, CHKDSK will display error messages, if any, and then a status report.

A sample status report follows:

```
160256 bytes total disk space
 8192 bytes in 2 hidden files
 512 bytes in 2 directories
30720 bytes in 8 user files
121344 bytes available on disk
```

```
65536 bytes total memory
53152 bytes free
```

CHKDSK will not correct the errors found in your directory unless you specify the /F (fix) switch. Typing /V causes CHKDSK to display messages while it is running.

You can redirect the output from CHKDSK to a file. Simply type:

```
CHKDSK A:>filename
```

The errors will be sent to the filename specified. Do not use the /F switch if you redirect CHKDSK output.

MESSAGES
<filename> contains
non-contiguous blocks
The file or files you named are not written
contiguously on the disk.

All specified file(s) are contiguous
The file or files you named are all written
sequentially on disk.

The following errors will be corrected
automatically if you specify the /F switch:

Cannot CHDIR to <filename>

Tree past this point not processed

CHKDSK is traveling the tree structure of
the directory and is unable to proceed to
the specified directory. All
subdirectories underneath this directory
will not be verified.

First cluster number is invalid

entry truncated

The file directory entry contains an
invalid pointer to the data area. If you
specified the /F switch, the file is
truncated to a zero-length file.

Allocation error, size adjusted

An invalid sector number was found in the
FAT. The file was truncated at the end of
the last valid sector.

Disk error reading FAT

One of your File Allocation Tables has a
defective sector in it. MS-DOS will
automatically use the other FAT. It is a
good idea to copy all your files onto
another disk.

Disk error writing FAT

One of your File Allocation Tables has a
defective sector in it. MS-DOS will
automatically use the other FAT. It is a
good idea to copy all your files onto
another disk.

You must correct the following errors returned
by CHKDSK, even if you specified the /F switch:

Incorrect DOS version

You cannot run CHKDSK on versions of MS-DOS
that are not 2.0 or higher.

Insufficient memory

Processing cannot continue

There is not enough memory in your machine to process CHKDSK for this disk. You must obtain more memory to run CHKDSK.

Invalid drive specification

Specify a valid drive.

Invalid parameter

One of the switches that you have specified is wrong.

Invalid sub-directory entry

The subdirectory that you have specified either does not exist or is invalid. Check to see that you have entered the subdirectory name correctly.

Errors found, F parameter not specified

Corrections will not be written to disk

You must specify the /F switch if you want the errors corrected by CHKDSK.

Invalid current directory

Processing cannot continue

Your disk is bad. Replace the disk or make a copy from your backup system disk.

Cannot CHDIR to root

Processing cannot continue

CHKDSK is traveling the tree structure of the directory and is unable to return to the root directory. CHKDSK is not able to continue checking the remaining subdirectories to the root.

<filename> is cross linked on cluster

Make a copy of the file you want to keep, and then delete both files that are cross linked.

X lost clusters found in y chains

Convert lost chains to files (Y/N)?

If you respond Y to this prompt, CHKDSK will create a directory entry and a file for you to resolve this problem (files created by CHKDSK are named FILEnnnn).

If you respond N to this prompt, and have specified the /F switch, CHKDSK will display:

X bytes disk space freed

If you respond N to this prompt and have not specified the /F switch, CHKDSK frees the clusters and displays:

X bytes disk space would be freed

Probable non-DOS disk

Continue (Y/N)?

The disk you are using is a non-DOS disk. You must indicate whether or not you want CHKDSK to continue processing.

Insufficient room in root directory

Erase files in root and repeat CHKDSK

CHKDSK cannot process until you delete files in the root directory.

Unrecoverable error in directory

Convert directory to file (Y/N)?

If you respond Y to this prompt, CHKDSK will convert the bad directory into a file. You can then fix the directory yourself or delete it.

If you respond N to this prompt, you may not be able to write to or read from the bad directory.

Entry has a bad attribute (or size or link)

This message may be preceded by one or two periods to indicate which subdirectory is invalid. If you have specified the /F switch, CHKDSK will attempt to correct the error.

Cannot recover . entry, processing continued

The . entry (current directory) is defective.

Cannot recover .. entry

The .. (parent directory) entry is defective.

Directory is totally empty, no . or ..

The specified directory does not contain references to current and parent directories. Delete the specified directory and recreate it.

(.)(..) does not exist

This is an informational message from
CHKDSK. This message indicates either the
. or the .. directory entry is invalid.

NAME	TYPE
CLS	Internal

PURPOSE
Clears the terminal screen.

SYNTAX
CLS

COMMENTS
The CLS command causes MS-DOS to send the ANSI escape sequence ESC[2J (which clears your screen) to your console.

NAME	TYPE
COPY	Internal

PURPOSE

Copies one or more files to another disk. If you prefer, you can give the copies different names. This command also copies files on the same disk and concatenates files.

SYNTAX

COPY [<pathname>] [<pathname>] [/V] [A] [/B]
(to copy)

COPY <filespec> + <filespec> ... <filespec>
(to concatenate)

COMMENTS To copy files:

NOTE

If the source and destination files are in the working directory, you do not need to specify a complete pathname.

If the second pathname option is not given, the copy will be on the default drive and will have the same name as the original file (first pathname option). If the first pathname is on the default drive and the second pathname is not specified, the COPY will be aborted. (Copying files to themselves is not allowed.) MS-DOS will display the error message:

File cannot be copied onto itself
0 File(s) copied

The second option may take three forms:

1. If the second option is a drive designation (d:) only, the original file is copied with the original filename to the designated drive.
2. If the second option is a filename only, the original file is copied to a file on the default drive with the filename specified.

3. If the second option is a full file specification, the original file is copied to a file on the default drive with the filename specified.

The /V switch causes MS-DOS to verify that the sectors written on the destination disk are recorded properly. Although there are rarely recording errors when you run COPY, you can verify that critical data has been correctly recorded. This option causes the COPY command to run more slowly because MS-DOS must check each entry recorded on the disk.

The /A and /B switches indicate that the files being processed are ASCII or binary files. Each switch applies to the file specification preceding it and to all remaining file specifications on the command line, until another /A or /B is encountered.

The following discussion applies to the A and /B switches:

When used with a source file specification:

- /A Causes the file to be treated as an ASCII (text) file. Data in the file is copied up to but not including the first end-of-file mark (in EDLIN, this is CTRL-Z). The remainder of the file is not copied.
- /B Causes the entire file to be copied, including any end-of-file mark.

When used with a target file specification:

- /A Causes an end-of-file character to be added as the last character of the file.
- /B Causes no end-of-file character to be added.

When you are concatenating files (see below), the default switch is always /A.

To concatenate files:

The COPY command also allows file concatenation (joining) while copying. Concatenation is accomplished by simply listing any number of files as options to COPY, separated by +. For example:

```
COPY A.XYZ + B.COM + B:C.TXT BIGFILE.CRP
```

This command concatenates files named A.XYZ, B.COM, and B:C.TXT and places them in the file on the default drive called BIGFILE.CRP.

To combine several files using wild cards into one file, you could type:

```
COPY *.LST COMBIN.PRN
```

This command would take all files with a filename extension of .LST and combine them into a file named COMBIN.PRN.

In the following example, for each file found matching *.LST, that file is combined with the corresponding .REF file. The result is a file with the same filename but with the extension .PRN. Thus, FILE1.LST will be combined with FILE1.REF to form FILE1.PRN; then XYZ.LST with XYZ.REF to form XYZ.PRN; and so on:

```
COPY *.LST + *.REF *.PRN
```

The following COPY command combines all files matching *.LST, then all files matching *.REF, into one file named COMBIN.PRN:

```
COPY *.LST + *.REF COMBIN.PRN
```

Do not enter a concatenation COPY command where one of the source filenames has the same extension as the destination. For example, the following command is an error if ALL.LST already exists:

```
COPY *.LST ALL.LST
```

The error would not be detected, however, until ALL.LST is appended. At this point it could have already been destroyed.

COPY compares the filename of the input file with the filename of the destination. If they are the same, that one input file is skipped, and the error message "Content of destination lost before copy" is printed. Further concatenation proceeds normally. This allows "summing" files, as in this example:

```
COPY ALL.LST + *.LST
```

This command appends all *.LST files, except ALL.LST itself, to ALL.LST. This command will

not produce an error message and is the correct way to append files using the COPY command.

MESSAGES

Cannot do binary reads from a device

The copy cannot be done in binary mode when you are copying from a device. Remove the /B switch or specify an ASCII copy with the /A switch.

Content of destination lost before copy

A file to be used as a source file to the COPY command has been overwritten prior to completion of the copy. Example: COPY A + B B destroys the file B before it can be copied.

NAME	TYPE
CTTY	Internal

PURPOSE

Allows you to change the device from which you issue commands (TTY represents the console).

SYNTAX

CTTY <device>

COMMENTS

The <device> is the device from which you are giving commands to MS-DOS. This command is useful if you want to change the device on which you are working. The command:

CTTY AUX

moves all command I/O (input/output) from the current device (the console) to the AUX port, such as a printer. The command:

CTTY CON

moves I/O back to the original device (here, the console). Refer to the "Illegal Filenames" section of Chapter 3, "More About Files," for a list of valid device names to use with the CTTY command.

NAME	DATE	TYPE	Internal
------	------	------	----------

PURPOSE

Enter or change the date known to the system. This date will be recorded in the directory for any files you create or alter.

You can change the date from your terminal or from a batch file. (MS-DOS does not display a prompt for the date if you use an AUTOEXEC.BAT file, so you may want to include a DATE command in that file.)

SYNTAX

DATE [<mm>-<dd>-<yy>]

COMMENTS

If you type DATE, DATE will respond with the message:

Current date is <mm>-<dd>-<yy>
Enter new date: _

Press <RETURN> if you do not want to change the date shown.

You can also type a particular date after the DATE command, as in:

DATE 3-9-81

In this case, you do not have to answer the Enter new date: prompt.

The new date must be entered using numerals only; letters are not permitted. The allowed options are:

<mm> = 1-12
<dd> = 1-31
<yy> = 80-99 or 1980-2099

The date, month, and year entries may be separated by hyphens (-) or slashes (/). MS-DOS is programmed to change months and years correctly, whether the month has 31, 30, 29, or 28 days. MS-DOS handles leap years, too.

MESSAGES

Invalid date

Enter new date: _

If the options or separators are not valid,
DATE displays this message. Enter a valid
date.

NAME	TYPE
DEL (DELETE)	Internal

SYNONYM

ERASE

PURPOSE

Deletes all files with the designated file specification.

SYNTAX

DEL [pathname]

COMMENTS

If the pathname is *.* , the prompt Are you sure? appears. If a Y or y is typed as a response, then all files are deleted as requested. You can also type ERASE for the DELETE command.

NAME	TYPE
DIR (DIRECTORY)	Internal

PURPOSE
Lists the files in a directory.

SYNTAX
DIR [pathname] [/P] [/W]

COMMENTS
If you just type DIR, all directory entries on the default drive are listed. If only the drive specification is given (DIR d:), all entries on the disk in the specified drive are listed. If only a filename is entered with no extension (DIR filename), then all files with the designated filename on the disk in the default drive are listed. If you designate a file specification (for example, DIR d:filename.ext), all files with the filename specified on the disk in the drive specified are listed. In all cases, files are listed with their size in bytes and with the time and date of their last modification.

The wild card characters ? and * (question mark and asterisk) may be used in the filename option. Note that for your convenience, the following DIR commands are equivalent:

COMMAND	EQUIVALENT
DIR	DIR *.*
DIR FILENAME	DIR FILENAME.*
DIR .EXT	DIR *.EXT

Two switches may be specified with DIR. The /P switch selects Page Mode. With /P, display of the directory pauses after the screen is filled. To resume display of output, press any key.

The /W switch selects Wide Display. With /W, only filenames are displayed, without other file information. Files are displayed five per line.

NAME	TYPE
DISKCOPY	External

PURPOSE

Copies the contents of the disk in the source drive to the disk in the destination drive.

SYNTAX

DISKCOPY [d:] [d:]

COMMENTS

The first option you specify is the source drive. The second option is the destination drive.

The disk in the destination drive must be formatted prior to using DISKCOPY.

You can specify the same drives or you may specify different drives. If the drives designated are the same, a single-drive copy operation is performed. You are prompted to insert the disks at the appropriate times. DISKCOPY waits for you to press any key before continuing.

After copying, DISKCOPY prompts:

```
Copy complete
Copy another (Y/N)?_
```

If you press Y, the next copy is performed on the same drives that you originally specified, after you have been prompted to insert the proper disks.

To end the COPY, press N.

Notes:

1. If you omit both options, a single-drive copy operation will be performed on the default drive.
2. If you omit the second option, the default drive will be used as the destination drive.
3. Both disks must have the same number of physical sectors and those sectors must be the same size.

4. Disks that have had a lot of file creation and deletion activity become fragmented, because disk space is not allocated sequentially. The first free sector found is the next sector allocated, regardless of its location on the disk.

A fragmented disk can cause poor performance due to delays involved in finding, reading, or writing a file. If this is the case, you must use the COPY command, instead of DISKCOPY, to copy your disk and eliminate the fragmentation.

For example:

```
COPY A:*. * B:
```

copies all files from the disk in drive A:
to the disk in drive B:.

5. DISKCOPY automatically determines the number of sides to copy, based on the source drive and disk.

MESSAGES

Copy not completed
DISKCOPY cannot copy the entire disk.

DISK error while reading drive A
Abort, Ignore, Retry?
Disk errors have been encountered during DISKCOPY processing. Refer to Appendix B, "Disk Errors," for information on this message.

Disks must be the same size
You cannot copy the contents of a disk with a different format using DISKCOPY. Use the COPY command to copy files onto the disk.

Source and target diskettes are not the same format. Cannot do the copy

You must have the same size and kind of disks to run DISKCOPY. Example: you cannot copy from a single-sided disk to a double-sided disk. Reformat the target disk to be of the same type as the source disk.

NAME	TYPE
EXE2BIN	External

PURPOSE

Converts .EXE (executable) files to binary format. This results in a saving of disk space and faster program loading.

SYNTAX

EXE2BIN <filespec> [d:][<filename>[<.ext>]]

COMMENTS

This command is useful only if you want to convert .EXE files to binary format. The file named by filespec is the input file. If no extension is specified, it defaults to .EXE. The input file is converted to .COM file format (memory image of the program) and placed in the output file. If you do not specify a drive, the drive of the input file will be used. If you do not specify an output filename, the input filename will be used. If you do not specify a filename extension in the output filename, the new file will be given an extension of .BIN.

The input file must be in valid .EXE format produced by the linker. The resident, or actual code and data part of the file must be less than 64K. There must be no STACK segment.

Two kinds of conversions are possible, depending on whether the initial CS:IP (Code Segment:Instruction Pointer) is specified in the .EXE file:

1. If CS:IP is not specified in the .EXE file, a pure binary conversion is assumed. If segment fixups are necessary (i.e., the program contains instructions requiring segment relocation), you will be prompted for the fixup value. This value is the absolute segment at which the program is to be loaded. The resulting program will be usable only when loaded at the absolute memory address specified by a user application. The command processor will not be capable of properly loading the program.

2. If CS:IP is specified as 0000:100H, it is assumed that the file is to be run as a .COM file with the location pointer set at 100H by the assembler statement ORG; the first 100H bytes of the file are deleted. No segment fixups are allowed, as .COM files must be segment relocatable; that is, they must assume the entry conditions explained in the Macro Assembler Manual. Once the conversion is complete, you may rename the resulting file with a .COM extension. Then the command processor will be able to load and execute the program in the same way as the .COM programs supplied on your MS-DOS disk.

MESSAGES

File cannot be converted

CS:IP does not meet either of the criteria specified above, or it meets the .COM file criterion but has segment fixups. This message is also displayed if the file is not a valid executable file.

File not found

The file is not on the disk specified.

Insufficient memory

There is not enough memory to run EXE2BIN.

File creation error

EXE2BIN cannot create the output file. Run CHKDSK to determine if the directory is full, or if some other condition caused the error.

Insufficient disk space

There is not enough disk space to create a new file.

Fixups needed - base segment (hex):

The source (.EXE) file contained information indicating that a load segment is required for the file. Specify the absolute segment address at which the finished module is to be located.

File cannot be converted

The input file is not in the correct
format.

WARNING -Read error in EXE file.

Amount read less than size in header
This is a warning message only.

NAME	TYPE
EXIT	Internal

PURPOSE

Exits the program COMMAND.COM (the command processor) and returns to a previous level, if one exists.

SYNTAX

EXIT

COMMENTS

This command can be used when you are running an application program and want to start the MS-DOS command processor, then return to your program. For example, to look at a directory on drive B: while running an application program, you must start the command processor by typing COMMAND in response to the default drive prompt:

A>COMMAND

You can now type the DIR command and MS-DOS will display the directory for drive B:. When you type EXIT, you return to the previous level (your application program).

NAME	TYPE
FIND	External

PURPOSE

Searches for a specific string of text in a file or files.

SYNTAX

FIND [/V /C /N] <string> [<filename...>]

COMMENTS

FIND is a filter that takes as options a string and a series of filenames. It will display all lines that contain a specified string from the files specified in the command line.

If no files are specified, FIND will take the input on the screen and display all lines that contain the specified string.

Switches for FIND are:

- /V causes FIND to display all lines not containing the specified string.
- /C causes FIND to print only the count of lines that contained a match in each of the files.
- /N causes each line to be preceded by its relative line number in the file.

The string should be enclosed in quotes.
Example:

```
FIND "Fool's Paradise" BOOK1.TXT BOOK2.TXT
```

displays all lines from BOOK1.TXT and BOOK2.TXT (in that order) that contain the string "Fool's Paradise." The command:

```
DIR B: | FIND /V "DAT"
```

causes MS-DOS to display all names of the files on the disk in drive B: which do not contain the string DAT. Type double quotes around a string that already has quotes in it.

MESSAGES

Incorrect DOS version

FIND will only run on versions of MS-DOS
that are 2.0 or higher.

FIND: Invalid number of parameters

You did not specify a string when issuing
the FIND command.

FIND: Syntax error

You typed an illegal string when issuing
the FIND command.

FIND: File not found <filename>

The filename you have specified does not
exist or FIND cannot find it.

FIND: Read error in <filename>

An error occurred when FIND tried to read
the file specified in the command.

FIND: Invalid parameter <option-name>

You specified an option that does not
exist.

NAME	FORMAT	TYPE	External
------	--------	------	----------

PURPOSE

Formats the disk in the specified drive to accept MS-DOS files.

SYNTAX

FORMAT [d:][/O][/V][/S]

COMMENTS

This command initializes the directory and file allocation tables. If no drive is specified, the disk in the default drive is formatted.

The /O switch causes FORMAT to produce an IBM personal Computer DOS version 1.X compatible disk. The /O switch causes FORMAT to reconfigure the directory with an OE5 hex byte at the start of each entry so that the disk may be used with 1.X versions of IBM(r) PC DOS, as well as MS-DOS 1.25/2.00 and IBM PC DOS 2.00. This switch should only be given when needed because it takes a fair amount of time for FORMAT to perform the conversion, and it noticeably decreases 1.25 and 2.00 performance on disks with few directory entries.

The /V switch causes FORMAT to prompt for a volume label after the disk is formatted.

If the /S switch is specified, it must be the last switch typed; then FORMAT copies operating system files from the disk in the default drive to the newly formatted disk. The files are copied in the following order:

IO.SYS
MSDOS.SYS
COMMAND.COM

MESSAGES

Disk unsuitable for system drive
FORMAT detected a bad track on the disk where system files should reside. You should only store data on the disk you tried to format when this message was displayed.

Insufficient memory for system transfer
Your memory configuration is insufficient
to transfer the MS-DOS system files IO.SYS
and MSDOS.SYS (the /S switch).

Invalid characters in volume label
The volume label should contain only up to
11 alphanumeric characters.

Track 0 bad - disk unusable
FORMAT can accommodate for defective
sectors on the disk except for those near
the beginning. In this case, use another
disk.

NAME	TYPE
MKDIR	Internal

SYNONYM
MD

PURPOSE
Makes a new directory.

SYNTAX
MKDIR <pathname>

COMMENTS
This command is used to create a hierarchical directory structure. When you are in your root directory, you can create subdirectories by using the MKDIR command. The command:

MKDIR \USER

will create a subdirectory \USER in your root directory. To create a directory named JOE under \USER, type:

MKDIR \USER\JOE

MESSAGES
Unable to create directory
MS-DOS could not create the directory you specified. Check to see that there is not a name conflict. You may have a file by the same name, or the disk may be full.

NAME	TYPE
MORE	External

PURPOSE
Sends output to console one screen at a time.

SYNTAX
MORE

COMMENTS
MORE is a filter that reads from standard input (such as a command from your terminal) and displays one screen of information at a time. The MORE command then pauses and displays the --MORE-- message at the bottom of your screen.

Pressing the <RETURN> key will display another screen of information. This process continues until all the input data has been read.

The MORE command is useful for viewing a long file one screen at a time. If you type:

TYPE MYFILES.COM | MORE

MS-DOS will display the file MYFILES.COM (on the default drive) one screen at a time.

NAME	TYPE
PATH	Internal

PURPOSE
Sets a command search path.

SYNTAX
PATH [<pathname>[;<pathname>]...]

COMMENTS
This command allows you to tell MS-DOS which directories should be searched for external commands after MS-DOS searches your working directory. The default value is no path.

To tell MS-DOS to search your \BIN\USER\JOE directory for external commands, type:

```
PATH \BIN\USER\JOE
```

MS-DOS will now search the \BIN\USER\JOE directory for external commands until you set another path or shut down MS-DOS.

You can tell MS-DOS to search more than one path by specifying several pathnames separated by semicolons. For example:

```
PATH \BIN\USER\JOE;\BIN\USER\SUE;\BIN\DEV
```

tells MS-DOS to search the directories specified by the above pathnames to find external commands. MS-DOS searches the pathnames in the order specified in the PATH command.

The command PATH with no options will print the current path. If you specify PATH ;, MS-DOS will set the NUL path, meaning that only the working directory will be searched for external commands.

MESSAGES

No path

You typed PATH with no options but have not set a command search path.

NAME	TYPE
PRINT	External

PURPOSE

Prints a text file on a line printer while you are processing other MS-DOS commands (usually called "background printing").

SYNTAX

PRINT [[filespec] [/T] [/C] [/P]]...

COMMENTS

You will use the PRINT command only if you have a line printer attached to your computer. The following switches are provided with this command:

- /T TERMINATE: this switch deletes all files in the print queue (those waiting to be printed). A message to this effect will be printed.
- /C CANCEL: This switch turns on cancel mode. The preceding filespec and all following filespecs will be suspended in the print queue until you type a /P switch.
- /P PRINT: This switch turns on print mode. The preceding filespec and all following filespecs will be added to the print queue until you issue a /C switch.

PRINT with no options displays the contents of the print queue on your screen without affecting the queue.

EXAMPLES:

PRINT /T Empties the print queue.

PRINT A:TEMP1.TST/C A:TEMP2.TST A:TEMP3.TST
 Removes the three files
 indicated from the print
 queue.

PRINT TEMP1.TST /C TEMP2.TST /P TEMP3.TST
 Removes TEMP1.TST from the
 queue, and adds TEMP2.TST
 and TEMP3.TST to the
 queue.

MESSAGES

All files canceled

If the /T (TERMINATE) switch is issued, the message "All files canceled by operator" will be output on your printer. If the current file being printed is canceled by a /C, the message "File canceled by operator" will be printed.

Cannot open (filename)

Either MS-DOS cannot find the specified file to print or the file does not exist. Check the command for a valid filename.

Errors on list device indicate that it may be offline. Please check it

Your printer is offline

(filename) file not found

You switched disks when a file was queued up, but before it started to print. Reissue the PRINT command for that filename.

List output is not assigned to a device

This message will be displayed if the "Name of list device" specified to the above prompt is invalid. Subsequent attempts will return the same message until a valid device is specified.

Name of list device [PRN:]

This prompt appears when PRINT is run the first time. Any current device may be specified and that device then becomes the PRINT output device. As indicated in the brackets, simply pressing <RETURN> results in the device PRN being used.

No files match d:XXXXXXXX.XXX

A filespec was given for files to add to the queue, but no files match a specification. NOTE: if there are no files in the queue to match the canceled filespec, no error message will appear.

PRINT queue is empty

There are no files in the print queue.

PRINT queue is full

There is room for 10 files in the queue.
If you attempt to put more than 10 files in
the queue, this message will appear on the
console.

Resident part of PRINT installed

This is the first message that MS-DOS
displays when you issue the PRINT command.
It means that available memory has been
reduced by several thousand bytes to
process the PRINT command concurrent with
other processes.

NAME	PROMPT	TYPE	Internal
------	--------	------	----------

PURPOSE
Changes the MS-DOS command prompt.

SYNTAX
PROMPT [<prompt-text>]

COMMENTS
This command allows you to change the MS-DOS system prompt (for example, A>). If no text is typed, the prompt will be set to the default prompt, which is the default drive designation. You can set the prompt to a special prompt, such as the current time, by using the characters indicated below.

The following characters can be used in the prompt command to specify special prompts. They must all be preceded by a dollar sign (\$) in the prompt command:

Specify
This

Character: To Get This Prompt:

\$	- The '\$' character
t	- The current time
d	- The current date
p	- The current directory of the default drive
v	- The version number
n	- The default drive
g	- The '>' character
l	- The '<' character
b	- The ' ' character
_	- A CR LF sequence
s	- A space (leading only)
h	- A backspace
e	- ASCII code X'1B' (escape)

EXAMPLES:

```
PROMPT $n
      Sets the default drive letter
      prompt.
PROMPT Time = $t$ _Date = $d
      Sets a two-line prompt which
      prints:
      Time = (current time)
      Date = (current date)
```

If your terminal has an ANSI escape sequence driver, then you can use escape sequences in your prompts. For example:

```
PROMPT $e[7m$n:$e[m
      Sets the prompts in inverse
      video mode and returns to
      video mode for other
      text.
```

NAME	TYPE
RECOVER	External

PURPOSE
Recovers a file or an entire disk containing bad sectors.

SYNTAX
RECOVER <filename | d:>

COMMENTS
If a sector on a disk is bad, you can recover either the file containing that sector (without the bad sector) or the entire disk (if the bad sector was in the directory).

To recover a particular file, type:

RECOVER <filename>

This will cause MS-DOS to read the file sector by sector and to skip the bad sector(s). When MS-DOS finds the bad sector(s), the sector(s) are marked and MS-DOS will no longer allocate your data to that sector.

To recover a disk, type:

RECOVER <d:>

where d: is the letter of the drive containing the disk to be recovered.

MESSAGES
(xxxx) of (xxxx) bytes recovered
This message tells you the number of bytes that MS-DOS was able to recover from the disk

Warning - directory full
The root directory is too full for RECOVER processing. Delete some files in the root directory to free space.

NAME	TYPE
REM (REMARK)	Internal

PURPOSE

Displays remarks which are on the same line as the REM command in a batch file during execution of that batch file.

SYNTAX

REM [comment]

COMMENTS

The only separators allowed in the comment are the space, tab, and comma.

EXAMPLE:

```
1: REM This file checks new disks
2: REM It is named NEWDISK.BAT
3: PAUSE Insert new disk in drive B:
4: FORMAT B:/S
5: DIR B:
6: CHKDSK B:
```

NAME	TYPE
REN (RENAME)	Internal

SYNONYM
RENAME

PURPOSE
Changes the name of the first option (filespec) to the second option (filename).

SYNTAX
REN <pathname> <filename>

COMMENTS
The first option (filespec) must be given a drive designation if the disk resides in a drive other than the default drive. Any drive designation for the second option (filename) is ignored. The file will remain on the disk where it currently resides.

The wild card characters may be used in either option. All files matching the first filespec are renamed. If wild card characters appear in the second filename, corresponding character positions will not be changed.

For example, the following command changes the names of all files with the .LST extension to similar names with the .PRN extension:

```
REN *.LST *.PRN
```

In the next example, REN renames the file ABODE on drive B: to ADOBE:

```
REN B:ABODE ?D?B?
```

The file remains on drive B:.

MESSAGES
File not found
You tried to rename a filespec to a name already present in the directory.

NAME	TYPE
RESTORE	External

PURPOSE

Restores files backed up using either the Microsoft or the IBM backup program.

SYNTAX

```
RESTORE <d:> [[ /B:<date> ] [ /A:<date> ] [ /E:<time> ] [ /L:<time> ]  
[ /M ] [ /N ]
```

COMMENTS

The first parameter you specify is the drive designator of the disk containing the backed up files. The second parameter is the file specification indicating which files you want to restore.

This restore program and the one supplied by IBM are compatible except for the extra switches described below.

The following switches are used with RESTORE:

- /S - Restore subdirectories also.
- /P - If any hidden or read-only files match the file specification, prompt for permission to restore them.
- /B - Only restore those files which were last modified on or before the given date.
- /A - Only restore those files which were last modified on or after the given date.
- /E - Only restore those files which were last modified at or earlier than the given time.
- /L - Only restore those files which were last modified at or later than the given time.
- /M - Only restore those files which have been modified since the last backup.
- /N - Only restore those files which no longer exist on the destination disk.

The backup program sets the ERRORLEVEL in the following manner:

- 0 Normal completion
- 1 No files were found to back up
- 3 Terminated by user
- 4 Terminated due to error

NAME		TYPE
	RMDIR (REMOVE DIRECTORY)	Internal

SYNONYM
RD

PURPOSE
Removes a directory from a hierarchical directory structure.

SYNTAX
RMDIR <pathname>

COMMENTS
This command removes a directory that is empty except for the . and .. shorthand symbols. You must delete all files first.

To remove the \BIN\USER\JOE directory, first issue a DIR command for that path to ensure that the directory does not contain any important files that you do not want deleted. Then type:

RMDIR \BIN\USER\JOE

The directory has been deleted from the directory structure.

NAME	TYPE
SET	Internal

PURPOSE

Sets one string value equivalent to another string for use in later programs.

SYNTAX

SET [<string=string>]

COMMENTS

This command is meaningful only if you want to set values that will be used by programs you have written. An application program can check all values that have been set with the SET command by issuing SET with no options. For example, SET TTY=VT52 sets your TTY value to VT52 until you change it with another SET command.

The SET command can also be used in batch processing. In this way, you can define your replaceable parameters with names instead of numbers. If your batch file contains the statement "LINK %FILE%", you can set the name that MS-DOS will use for that variable with the SET command. The command SET FILE=DOMORE replaces the %FILE% parameter with the filename DOMORE. Therefore, you do not need to edit each batch file to change the replaceable parameter names. Note that when you use text (instead of numbers) as replaceable parameters, the name must be ended by a percent sign.

If you type SET with no arguments, MS-DOS displays the current setting of SET.

NAME	TYPE
SORT	External

PURPOSE

SORT reads input from your terminal, sorts the data, then writes it to your terminal screen or files.

SYNTAX

SORT [/R] [/+n]

COMMENTS

SORT can be used, for example, to alphabetize a file by a certain column. There are two switches which allow you to select options:

/R reverse the sort; that is, sort from Z to A.

/+n sort starting with column n where n is some number. If you do not specify this switch, SORT will begin sorting from column 1.

EXAMPLES:

This command will read the file UNSORT.TXT, reverse the sort, and then write the output to a file named SORT.TXT:

```
SORT /R <UNSORT.TXT >SORT.TXT
```

The following command will pipe the output of the directory command to the SORT filter. The SORT filter will sort the directory listing starting with column 14 (this is the column in the directory listing that contains the file size), then send the output to the console. Thus, the result of this command is a directory sorted by file size:

```
DIR | SORT /+14
```

The command:

```
DIR | SORT /+14 | MORE
```

will do the same thing as the command in the previous example, except that the MORE filter will give you a chance to read the sorted directory one screen at a time.

NAME	TYPE
SYS (SYSTEM)	External

PURPOSE
Transfers the MS-DOS system files from the disk in the default drive to the disk in the drive specified by d:.

SYNTAX
SYS <d:>

COMMENTS
SYS is normally used to update the system or to place the system on a formatted disk which contains no files. An entry for d: is required.

If IO.SYS and MSDOS.SYS are on the destination disk, they must take up the same amount of space on the disk as the new system will need. This means that you cannot transfer system files from an MS-DOS 2.0 disk to an MS-DOS 1.1 disk. You must reformat the MS-DOS 1.1 disk with the MS-DOS FORMAT command before the SYS command will work.

The destination disk must be completely blank or already have the system files IO.SYS and MSDOS.SYS.

The transferred files are copied in the following order:

IO.SYS
MSDOS.SYS

IO.SYS and MSDOS.SYS are both hidden files that do not appear when the DIR command is executed. COMMAND.COM (the command processor) is not transferred. You must use the COPY command to transfer COMMAND.COM.

MESSAGES
No room for system on destination disk
There is not enough room on the destination disk for the IO.SYS and MSDOS.SYS files.

Incompatible system size

The system files IO.SYS and MSDOS.SYS do not take up the same amount of space on the destination disk as the new system will need.

NAME	TIME	TYPE
		Internal

PURPOSE
Displays and sets the time.

SYNTAX
TIME [<hh>[:<mm>]]

COMMENTS
If the TIME command is entered without any arguments, the following message is displayed:

Current time is <hh>:<mm>:<ss>.<cc>
Enter new time: _

Press the <RETURN> key if you do not want to change the time shown. A new time may be given as an option to the TIME command as in:

TIME 8:20

The new time must be entered using numerals only; letters are not allowed. The allowed options are:

<hh> = 00-24
<mm> = 00-59

The hour and minute entries must be separated by colons. You do not have to type the <ss> (seconds) or <cc> (hundredths of seconds) options.

MS-DOS uses the time entered as the new time if the options and separators are valid. If the options or separators are not valid, MS-DOS displays the message:

Invalid time
Enter new time: _

MS-DOS then waits for you to type a valid time.

NAME	TYPE
	Internal

PURPOSE

Displays the contents of the file on the console screen.

SYNTAX

TYPE <filespec>

COMMENTS

Use this command to examine a file without modifying it. (Use DIR to find the name of a file and EDLIN to alter the contents of a file.) The only formatting performed by TYPE is that tabs are expanded to spaces consistent with tab stops every eighth column. Note that a display of binary files causes control characters (such as CONTROL-Z) to be sent to your computer, including bells, form feeds, and escape sequences.

NAME	VER	TYPE	Internal
------	-----	------	----------

PURPOSE
Prints MS-DOS version number.

SYNTAX
VER

COMMENTS
If you want to know what version of MS-DOS you are using, type VER. The version number will be displayed on your screen.

NAME	TYPE
VERIFY	Internal

PURPOSE
Turns the verify switch on or off when writing to disk.

SYNTAX
VERIFY [ON|OFF]

COMMENTS

This command has the same purpose as the /V switch in the COPY command. If you want to verify that all files are written correctly to disk, you can use the VERIFY command to tell MS-DOS to verify that your files are intact (no bad sectors, for example). MS-DOS will perform a VERIFY each time you write data to a disk. You will receive an error message only if MS-DOS was unable to successfully write your data to disk.

VERIFY ON remains in effect until you change it in a program (by a SET VERIFY system call), or until you issue a VERIFY OFF command to MS-DOS.

If you want to know what the current setting of VERIFY is, type VERIFY with no options.

NAME	TYPE
VOL (VOLUME)	Internal

PURPOSE
Displays disk volume label, if it exists.

SYNTAX
VOL [d:]

COMMENTS
This command prints the volume label of the disk in drive d:. If no drive is specified, MS-DOS prints the volume label of the disk in the default drive.

MESSAGES
Volume in drive x has no label
The disk in the drive does not have a volume label.

5.3 BATCH PROCESSING COMMANDS

The following commands are called batch processing commands. They can add flexibility and power to your batch programs. The commands discussed are ECHO, FOR, GOTO, IF, and SHIFT.

If you are not writing batch programs, you do not need to read this section.

NAME	TYPE
ECHO	Internal

PURPOSE
Turns batch echo feature on and off.

SYNTAX
ECHO [ON |OFF| <message>]

COMMENTS
Normally, commands in a batch file are displayed ("echoed") on the console when they are seen by the command processor. ECHO OFF turns off this feature. ECHO ON turns the echo back on.

If ON or OFF are not specified, the current setting is displayed.

ECHO <message> is only useful if ECHO is off and you are using a batch file. By typing ECHO and a message in your batch file, you can print messages on the console.

NAME	TYPE
FOR	Internal

PURPOSE

Command extension used in batch and interactive file processing.

SYNTAX

```
FOR %%<c> IN <set> DO <command>
(for batch processing)
FOR %<c> IN <set> DO <command>
(for interactive processing)
```

COMMENTS

<c> can be any character except 0,1,2,3,...,9 to avoid confusion with the %0-%9 batch parameters.

<set> is (#<item>*)

The %%<c> variable is set sequentially to each member of <set>, and then <command> is evaluated. If a member of <set> is an expression involving * and/or ?, then the variable is set to each matching pattern from disk. In this case, only one such <item> may be in the set, and any <item> besides the first is ignored.

Examples:

```
FOR %%f IN ( *.ASM ) DO MASM %%f;
```

```
FOR %%f IN (FOO BAR BLECH) DO REM %%f
```

The '%' is needed so that after batch parameter (%0-%9) processing is done, there is one '%' left. If only '%f' were there, the batch parameter processor would see the '%', look at 'f', decide that '%f' was an error (bad parameter reference) and throw out the '%f', so that the command FOR would never see it. If the FOR is not in a batch file, then only one '%' should be used.

MESSAGES

```
FOR cannot be nested
Nesting of FOR statements is illegal.
```

NAME	TYPE
GOTO	Internal

PURPOSE
Command extension used in batch file processing.

SYNTAX
GOTO <label>

COMMENTS
GOTO causes commands to be taken from the batch file beginning with the line after the <label> definition. If no label has been defined, the current batch file will terminate.

Example:

```
:foo  
REM looping...  
GOTO foo
```

will produce an infinite sequence of messages:
REM looping....

Starting a line in a batch file with ':' causes the line to be ignored by batch processing. The characters following GOTO define a label, but this procedure may also be used to put in comment lines.

NAME	TYPE
IF	Internal

PURPOSE

Command extension used in batch file processing.

SYNTAX

IF <condition> <command>

COMMENTS

The parameter <condition> is one of the following:

ERRORLEVEL <number>

True if and only if the previous program executed by COMMAND had an exit code of <number> or higher.

<string1> == <string2>

True if and only if <string1> and <string2> are identical after parameter substitution. Strings may not have embedded separators.

EXIST <filename>

True if and only if <filename> exists.

NOT <condition>

True if and only if <condition> is false.

The IF statement allows conditional execution of commands. When the <condition> is true, then the <command> is executed. Otherwise, the <command> is ignored.

EXAMPLES:

IF NOT EXIST FOO ECHO Can't find file

IF NOT ERRORLEVEL 3 LINK \$1,,;

NAME	TYPE
PAUSE	Internal

PURPOSE
Suspends execution of the batch file.

SYNTAX
PAUSE [comment]

COMMENTS
During the execution of a batch file, you may need to change disks or perform some other action. PAUSE suspends execution until you press any key, except <CONTROL-C>.

When the command processor encounters PAUSE, it prints:

Strike a key when ready . . .

If you press <CONTROL-C>, another prompt will be displayed:

Abort batch job (Y/N)?

If you type Y in response to this prompt, execution of the remainder of the batch command file will be aborted and control will be returned to the operating system command level. Therefore, PAUSE can be used to break a batch file into pieces, allowing you to end the batch command file at an intermediate point.

The comment is optional and may be entered on the same line as PAUSE. You may also want to prompt the user of the batch file with some meaningful message when the batch file pauses. For example, you may want to change disks in one of the drives. An optional prompt message may be given in such cases. The comment prompt will be displayed before the "Strike a key" message.

NAME	SHIFT	TYPE
		Internal

PURPOSE

Allows access to more than 10 replaceable parameters in batch file processing.

SYNTAX

SHIFT

COMMENTS

Usually, command files are limited to handling 10 parameters, %0 through %9. To allow access to more than ten parameters, use SHIFT to change the command line parameters. For example:

```
if      %0 = "foo"
        %1 = "bar"
        %2 = "name"
        %3...%9 are empty
```

then a SHIFT will result in the following:

```
%0 = "bar"
%1 = "name"
%2...%9 are empty
```

If there are more than 10 parameters given on a command line, those that appear after the 10th (%9) will be shifted one at a time into %9 by successive shifts.

CHAPTER 6

MS-DOS EDITING AND FUNCTION KEYS

Special MS-DOS Editing Keys

Control Character Functions

6.1 SPECIAL MS-DOS EDITING KEYS

The special editing keys deserve particular emphasis because they depart from the way in which most operating systems handle command input. You do not have to type the same sequences of keys repeatedly, because the last command line is automatically placed in a special storage area called a template.

By using the template and the special editing keys, you can take advantage of the following MS-DOS features:

1. A command line can be instantly repeated by pressing two keys.
2. If you make a mistake in the command line, you can edit it and retry without having to retype the entire command line.
3. A command line that is similar to a preceding command line can be edited and executed with a minimum of typing by pressing a special editing key.

The relationship between the command line and the template is shown in Figure 8:

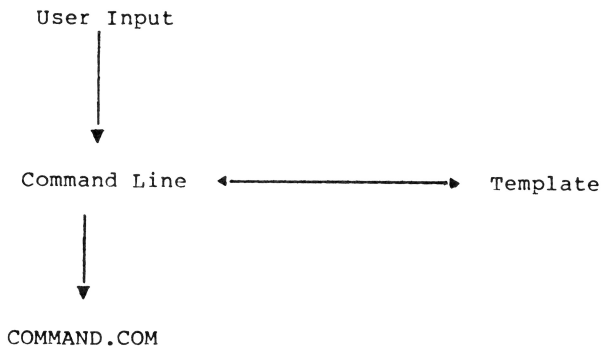


Figure 8. Command Line and Template

As seen in Figure 8, the user (you) types a command to MS-DOS on the command line. When you press the <RETURN> key, the command is automatically sent to the command processor (COMMAND.COM) for execution. At the same time, a copy of this command is sent to the template. You can now recall the command or modify it with MS-DOS special editing keys.

Table 6.1 contains a complete list of the special editing keys. Each of these keys is more fully described in Chapter 7, "The Line Editor (EDLIN)," where they can be used to edit your text files.

NOTE

The keys on your keyboard may not correspond to the specific keys in the following examples. Therefore, these MS-DOS editing keys will be referred to by FUNCTION rather than by name. When an example says to press the <SKIPl> key, find the key on your keyboard that corresponds to the "skip one character" editing function and press it. Some functions will require you to press two keys. Consult the operating manual for your terminal to determine which keys correspond to the MS-DOS editing functions described here.

You may wish to write in the keys on your keyboard that correspond to the editing keys described below. Space is provided in the following table to do this:

Table 6.1 Special Editing Functions

Key	Editing Function	Your Keyboard
<COPY1>	Copies one character from the template to the command line	
<COPYUP>	Copies characters up to the character specified in the template and puts these characters on the command line	
<COPYALL>	Copies all remaining characters in the template to the command line	
<SKIP1>	Skips over (does not copy) a character in the template	
<SKIPUP>	Skips over (does not copy) the characters in the template up to the character specified	
<VOID>	Voids the current input; leaves the template unchanged	
<INSERT>	Enters/exits insert mode	
<NEWLINE>	Makes the new line the new template	
<CONTROL-Z>	Puts a CONTROL-Z (LAH) end-of-file character in the new template	

Examples:

If you type the following command:

```
DIR PROG.COM
```

MS-DOS displays information about the file PROG.COM on your screen. The command line is also saved in the template. To repeat the command, just press two keys: <COPYALL> and <RETURN>.

The repeated command is displayed on the screen as you type, as shown below:

```
<COPYALL>DIR PROG.COM<RETURN>
```

Notice that pressing the <COPYALL> key causes the contents

of the template to be copied to the command line; pressing <RETURN> causes the command line to be sent to the command processor for execution.

If you want to display information about a file named PROG.ASM, you can use the contents of the template and type:

```
<COPYUP>C
```

Typing <COPYUP>C copies all characters from the template to the command line, up to but not including C. MS-DOS displays:

```
DIR PROG._
```

Note that the underline is your cursor. Now type:

```
.ASM
```

The result is:

```
DIR PROG.ASM_
```

The command line DIR PROG.ASM is now in the template and ready to be sent to the command processor for execution. To do this, press <RETURN>.

Now assume that you want to execute the following command:

```
TYPE PROG.ASM
```

To do this, type:

```
TYPE<INSERT> <COPYALL><RETURN>
```

Notice that when you are typing, the characters are entered directly into the command line and overwrite corresponding characters in the template. This automatic replacement feature is turned off when you press the insert key. Thus, the characters "TYPE" replace the characters "DIR " in the template. To insert a space between "TYPE" and "PROG.ASM", you pressed <INSERT> and then the space bar. Finally, to copy the rest of the template to the command line, you pressed <COPYALL> and then <RETURN>. The command TYPE PROG.ASM has been processed by MS-DOS, and the template becomes TYPE PROG.ASM.

If you had misspelled TYPE as BYTE, a command error would have occurred. Still, instead of throwing away the whole command, you could save the misspelled line before you press <RETURN> by creating a new template with the <NEWLINE> key:

```
BYTE PROG.ASM<NEWLINE>
```

You could then edit this erroneous command by typing:

T<COPY1>P<COPYALL>

The <COPY1> key copies a single character from the template to the command line. The resulting command line is then the command that you want:

TYPE PROG.ASM

As an alternative, you can use the same template containing BYTE PROG.ASM and then use the <SKIPl> and <INSERT> keys to achieve the same result:

<SKIPl><SKIPl><COPY1><INSERT>YP<COPYALL>

To illustrate how the command line is affected as you type, examine the keys typed on the left; their effect on the command line is shown on the right:

<SKIPl>	—	Skips over 1st template character
<SKIPl>	—	Skips over 2nd template character
<COPY1>	T	Copies 3rd template character
<INSERT>YP	TYP	Inserts two characters
<COPYALL>	TYPE PROG.ASM	Copies rest of template

Notice that <SKIPl> does not affect the command line. It affects the template by deleting the first character. Similarly, <SKIPUP> deletes characters in the template, up to but not including a given character.

These special editing keys can add to your effectiveness at the keyboard. The next section describes control character functions that can also help when you are typing commands.

6.2 CONTROL CHARACTER FUNCTIONS

A control character function is a function that affects the command line. You have already learned about <CONTROL-C> and <CONTROL-S>. Other control character functions are described below.

Remember that when you type a control character, such as <CONTROL-C>, you must hold down the control key and then press the C key.

Table 6.2 Control Character Functions

Control Character	Function
<CONTROL-N>	Toggles echoing of output to line printer.
<CONTROL-C>	Aborts current command.
<CONTROL-H>	Removes last character from command line and erases character from terminal screen.
<CONTROL-J>	Inserts physical end-of-line, but does not empty command line. Use the <LINE FEED> key to extend the current logical line beyond the physical limits of one terminal screen.
<CONTROL-P>	Toggles terminal output to line printer.
<CONTROL-S>	Suspends output display on terminal screen. Press any key to resume.
<CONTROL-X>	Cancel the current line; empties the command line; and then outputs a back slash (\), carriage return, and line feed. The template used by the special editing commands is not affected.

CHAPTER 7

EDLIN

Introduction

How to Start EDLIN

Special Editing Keys

Command Information

 Command Options

EDLIN Commands

Error Messages

7.1 INTRODUCTION

In this chapter, you will learn how to use EDLIN, the line editor program. You can use EDLIN to create, change, and display files, whether they are source program or text files.

You can use EDLIN to:

1. Create new source files and save them.
2. Update existing files and save both the updated and original files.
3. Delete, edit, insert, and display lines.
4. Search for, delete, or replace text within one or more lines.

The text in files created or edited by EDLIN is divided into lines, each up to 253 characters long. Line numbers are generated and displayed by EDLIN during the editing process, but are not actually present in the saved file.

When you insert lines, all line numbers following the inserted text advance automatically by the number of lines being inserted. When you delete lines in a file, all line numbers following the deleted text decrease automatically by the number of lines deleted. As a result, lines are always numbered consecutively in your file.

7.2 HOW TO START EDLIN

To start EDLIN, type:

```
EDLIN <filespec>
```

If you are creating a new file, the <filespec> should be the name of the file you wish to create. If EDLIN does not find this file on a drive, EDLIN will create a new file with the name you specify. The following message and prompt will be displayed:

```
New file
*_
```

Notice that the prompt for EDLIN is an asterisk (*).

You can now type lines of text into your new file. To begin entering text, you must enter an I (Insert) command to insert lines. The I command is discussed later in this chapter.

If you want to edit an existing file, <filespec> should be the name of the file you want to edit. When EDLIN finds the file you specify on the designated or default drive, the file will be loaded into memory. If the entire file can be loaded, EDLIN will display the following message on your screen:

```
End of input file
*
```

You can then edit the file using EDLIN editing commands.

If the file is too large to be loaded into memory, EDLIN will load lines until memory is 3/4 full, then display the * prompt. You can then edit the portion of the file that is in memory.

To edit the remainder of the file, you must save some of the edited lines on disk to free memory; then EDLIN can load the unedited lines from disk into memory. Refer to the Write and Append commands in this chapter for the procedure.

When you complete the editing session, you can save the original and the updated (new) files by using the End command. The End command is discussed in this chapter in the section "EDLIN Commands". The original file is renamed with an extension of .BAK, and the new file has the filename and extension you specify in the EDLIN command. The original .BAK file will not be erased until the end of the editing session, or until disk space is needed by the editor (EDLIN).

Do not try to edit a file with a filename extension of .BAK because EDLIN assumes that any .BAK file is a backup file. If you find it necessary to edit such a file, rename the file with another extension (using the MS-DOS RENAME command discussed in Chapter 5), then start EDLIN and specify the new <filespec>.

7.3 SPECIAL EDITING KEYS

The special editing keys and template discussed in Chapter 6 can be used to edit your text files. These keys are discussed in detail in this section.

Table 7.1 summarizes the commands, codes, and functions. Descriptions of the special editing keys follow the table.

NOTE

The keys on your keyboard may not correspond to the specific keys in the following examples. Therefore, these MS-DOS editing keys will be referred to by FUNCTION rather than by name. When an example says to press the <SKIPl> key, find the key on your keyboard that corresponds to the "skip one character" editing function and press it. Some functions may require you to press two keys. Consult the operating manual for your terminal to determine which keys correspond to the MS-DOS editing functions described here.

Table 7.1 Special Editing Keys

Function	Key	Description
Copy one character	<COPY1>	Copies one character from the template to the new line.
Copy up to character	<COPYUP>	Copies all characters from the template to the new line, up to the character specified.
Copy template	<COPYALL>	Copies all remaining characters in the template to the screen.
Skip one character	<SKIP1>	Does not copy (skips over) a character.
Skip up to character	<SKIPUP>	Does not copy (skips over) the characters in the template, up to the character specified.
Quit input	<VOID>	Voids the current input; leaves the template unchanged.
Insert mode	<INSERT>	Enters/exits insert mode.
Replace mode	<REPLACE>	Turns insert mode off; this is the default.
New template	<NEWLINE>	Makes the new line the new template.

KEY

<COPY1>

PURPOSE

Copies one character from the template to the command line.

COMMENTS

Pressing the <COPY1> key copies one character from the template to the command line. When the <COPY1> key is pressed, one character is inserted in the command line and insert mode is automatically turned off.

EXAMPLE:

Assume that the screen shows:

```
1:*This is a sample file.  
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPY1> key copies the first character (T) to the second of the two lines displayed:

```
1:*This is a sample file  
<COPY1> 1:*T_
```

Each time the <COPY1> key is pressed, one more character appears:

```
<COPY1> 1:*Th_  
<COPY1> 1:*ThI_  
<COPY1> 1:*This_
```

KEY

<COPYUP>

PURPOSE

Copies multiple characters up to a given character.

COMMENTS

Pressing the <COPYUP> key copies all characters up to a given character from the template to the command line. The given character is the next character typed after <COPYUP>; it is not copied or displayed on the screen. Pressing the <COPYUP> key causes the cursor to move to the single character that is specified in the command. If the template does not contain the specified character, nothing is copied. Pressing <COPYUP> also automatically turns off insert mode.

EXAMPLE:

Assume that the screen shows:

```
1:*This is a sample file.  
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPYUP> key copies all characters up to the character specified immediately after the <COPYUP> key:

```
1:*This is a sample file  
<COPYUP>p 1:*This is a sam_
```


KEY

<COPYALL>

PURPOSE

Copies template to command line.

COMMENTS

Pressing the <COPYALL> key copies all remaining characters from the template to the command line. Regardless of the cursor position at the time the <COPYALL> key is pressed, the rest of the line appears, and the cursor is positioned after the last character on the line.

EXAMPLE:

Assume that the screen shows:

```
l:*This is a sample file.  
l:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPYALL> key copies all characters from the template (shown in the upper line displayed) to the line with the cursor (the lower line displayed):

```
l:*This is a sample file (template)  
<COPYALL> l:*This is a sample file._ (command  
line)
```

Also, insert mode is automatically turned off.

KEY

<SKIPl>

PURPOSE

Skips over one character in the template.

COMMENTS

Pressing the <SKIPl> key skips over one character in the template. Each time you press the <SKIPl> key, one character is not copied from the template. The action of the <SKIPl> key is similar to the <COPYl> key, except that <SKIPl> skips a character in the template rather than copying it to the command line.

EXAMPLE:

Assume that the screen shows:

```
l:*This is a sample file.  
l:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <SKIPl> key skips over the first character (T):

```
l:*This is a sample file  
<SKIPl> l:*_
```

The cursor position does not change and only the template is affected. To see how much of the line has been skipped over, press the <COPYALL> key, which moves the cursor beyond the last character of the line:

```
l:*This is a sample file.  
<SKIPl> l:*_  
<COPYALL> l:*his is a sample file._
```

KEY

<SKIPUP>

PURPOSE

Skips multiple characters in the template up to the specified character.

COMMENTS

Pressing the <SKIPUP> key skips over all characters up to a given character in the template. This character is not copied and is not shown on the screen. If the template does not contain the specified character, nothing is skipped over. The action of the <SKIPUP> key is similar to the <COPYUP> key, except that <SKIPUP> skips over characters in the template rather than copying them to the command line.

EXAMPLE:

Assume that the screen shows:

```
l:*This is a sample file.  
l:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <SKIPUP> key skips over all the characters in the template up to the character pressed after the <SKIPUP> key:

```
l:*This is a sample file  
<SKIPUP>p l:*_
```

The cursor position does not change. To see how much of the line has been skipped over, press the <COPYALL> key to copy the template. This moves the cursor beyond the last character of the line:

```
l:*This is a sample file:  
<SKIPUP>p<COPYALL> l:*ple file._
```

KEY

<VOID>

PURPOSE

Quits input and empties the command line.

COMMENTS

Pressing the <VOID> key empties the command line, but it leaves the template unchanged. <VOID> also prints a back slash (\), carriage return, and line feed, and turns insert mode off. The cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPYALL> key copies the template to the command line and the command line appears as it was before <VOID> was pressed.

EXAMPLE:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you want to replace the line with "Sample File:"

```
1:*This is a sample file.
1:*Sample File_
```

To cancel the line you just entered (Sample File), and to keep "This is a sample file.", press <VOID>. Notice that a backslash appears on the Sample File line to tell you it has been cancelled:

```
1:*This is a sample file.
<VOID> 1:*Sample File\
1: _
```

Press <RETURN> to keep the original line, or to perform any other editing functions. If <COPYALL> is pressed, the original template is copied to the command line:

```
<COPYALL> 1: This is a sample file._
```

KEY

<INSERT>

PURPOSE

Enters/exits insert mode.

COMMENTS

Pressing the <INSERT> key causes EDLIN to enter and exit insert mode. The current cursor position in the template is not changed. The cursor does move as each character is inserted. However, when you have finished inserting characters, the cursor will be positioned at the same character as it was before the insertion began. Thus, characters are inserted in front of the character to which the cursor points.

EXAMPLE:

Assume that the screen shows:

```
l:*This is a sample file.
l:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you press the <COPYUP> and f keys:

```
l:*This is a sample file
<COPYUP>f l:*This is a sample _
```

Now press the <INSERT> key and insert the characters "edit" and a space:

```
l:*This is a sample file.
<COPYUP>f l:*This is a sample _
<INSERT>edit l:*This is a sample edit _
```

If you now press the <COPYALL> key, the rest of the template is copied to the line:

```
l:*This is a sample edit _
<COPYALL> l:*This is a sample edit file._
```

If you pressed the <RETURN> key, the remainder of the template would be truncated, and the command line would end at the end of the insert:

```
<INSERT>edit <RETURN> 1:*This is a sample edit _
```

To exit insert mode, simply press the <INSERT> key again.

KEY

<REPLACE>

PURPOSE

Enters replace mode.

COMMENTS

Pressing the <REPLACE> key causes EDLIN to exit insert mode and to enter replace mode. All the characters you type will overstrike and replace characters in the template. When you start to edit a line, replace mode is in effect. If the <RETURN> key is pressed, the remainder of the template will be deleted.

EXAMPLE:

Assume that the screen shows:

```
1:*This is a sample file.  
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you then press <COPYUP>m, <INSERT>lary, <REPLACE> tax, and then <COPYALL>:

```
1:*This is a sample file.  
<COPYUP>m 1:*This is a sa  
<INSERT>lary 1:*This is a sa_lary_  
<REPLACE> tax 1:*This is a salary tax_  
<COPYALL> 1:*This is a salary tax file._
```

Notice that you inserted lary and replaced mple with tax. If you type characters that extend beyond the length of the template, the remaining characters in the template will be automatically appended when you press <COPYALL>.

KEY

<NEWLINE>

PURPOSE

Creates a new template.

COMMENTS

Pressing the <NEWLINE> key copies the current command line to the template. The contents of the old template are deleted. Pressing <NEWLINE> outputs an @ ("at sign" character), a carriage return, and a line feed. The command line is also emptied and insert mode is turned off.

NOTE

<NEWLINE> performs the same function as the <VOID> key, except that the template is changed and an @ ("at sign" character) is printed instead of a \ (backslash).

EXAMPLE:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you enter <COPYUP>m, <INSERT>lary, <REPLACE> tax, and then <COPYALL>:

```
1:*This is a sample file.
<COPYUP>m 1:*This is a sa
<INSERT>lary 1:*This is a salary_
<REPLACE> tax 1:*This is a salary tax_
<COPYALL> 1:*This is a salary tax file._
```


At this point, assume that you want this line to be the new template, so you press the <NEWLINE>key:

<NEWLINE>l:*This is a salary tax file.@

The @ indicates that this new line is now the new template. Additional editing can be done using the new template.

7.4 COMMAND INFORMATION

EDLIN commands perform editing functions on lines of text. The following list contains information you should read before you use EDLIN commands:

1. Pathnames are acceptable as options to commands. For example, typing EDLIN \BIN\USER\JOE\TEXT.TXT will allow you to edit the TEXT.TXT file in the subdirectory JOE.
2. You can reference line numbers relative to the current line (the line with the asterisk). Use a minus sign with a number to indicate lines before the current line. Use a plus sign with a number to indicate lines after the current line.

Example:

```
-10,+10L
```

This command lists 10 lines before the current line, the current line, and 10 lines after the current line.

3. Multiple commands may be issued on one command line. When you issue a command to edit a single line using a line number (<line>), a semicolon must separate commands on the line. Otherwise, one command may follow another without any special separators. In the case of a Search or Replace command, the <string> may be ended by a <CONTROL-Z> instead of a <RETURN>.

Examples:

The following command line edits line 15 and then displays lines 10 through 20 on the screen:

```
15;-5,+5L
```

The command line in the next example searches for "This string" and then displays 5 lines before and 5 lines

after the line containing the matched string. If the search fails, then the displayed lines are those line numbers relative to the current line:

```
SThis string<CONTROL-Z>-5,+5L
```

4. You can type EDLIN commands with or without a space between the line number and command. For example, to delete line 6, the command 6D is the same as 6 D.
5. It is possible to insert a control character (such as CONTROL-C) into text by using the quote character CONTROL-V before it while in insert mode. CONTROL-V tells MS-DOS to recognize the next capital letter typed as a control character. It is also possible to use a control character in any of the string arguments of Search or Replace by using the special quote character. For example:

```
S<CONTROL-V>Z
will find the first occurrence
of CONTROL-Z in a file
```

```
R<CONTROL-V>Z<CONTROL-Z>foo
will replace all occurrences
of CONTROL-Z in a file by foo
```

```
S<CONTROL-V>C<CONTROL-Z>bar
will replace all occurrences
of CONTROL-C by bar
```

It is possible to insert CONTROL-V into the text by typing CONTROL-V-V.

6. The CONTROL-Z character ordinarily tells EDLIN, "This is the end of the file." If you have CONTROL-Z characters elsewhere in your file, you must tell EDLIN that these other control characters do not mean end-of-file. Use the /B switch to tell EDLIN to ignore any CONTROL-Z characters in the file and to show you the entire file.

The EDLIN commands are summarized in the following table. They are also described in further detail in Section 7.5.

Table 7.2 EDLIN Commands

Command	Purpose
<line>	Edits line no.
A	Appends lines
C	Copies lines
D	Deletes lines
E	Ends editing
I	Inserts lines
L	Lists text
M	Moves lines
P	Pages text
Q	Quits editing
R	Replaces lines
S	Searches text
T	Transfers text
W	Writes lines

7.4.1 Command Options

Several EDLIN commands accept one or more options. The effect of a command option varies, depending on with which command it is used. The following list describes each option:

<line> <line> indicates a line number that you type. Line numbers must be separated by a comma or a space from other line numbers, other options, and from the command.

 <line> may be specified one of three ways:

Number Any number less than 65534. If a number larger than the largest existing line number is specified, then <line> means the line after the last line number.

Period (.) If a period is specified for <line>, then <line> means the current line number. The current line is the last line edited, and is not necessarily the last line displayed. The current line is marked on your screen by an asterisk (*) between the line number and the first character.

Pound (#) The pound sign indicates the line after the last line number. If you specify # for <line>, this has the same effect as specifying a number larger than the last line number.

<RETURN> A carriage return entered without any of the <line> specifiers listed above directs EDLIN to use a default value appropriate to the command.

? The question mark option directs EDLIN to ask you if the correct string has been found. The question mark is used only with the Replace and Search commands. Before continuing, EDLIN waits for either a Y or <RETURN> for a yes response, or for any other key for a no response.

<string> <string> represents text to be found, to be replaced, or to replace other text. The <string> option is used only with the Search and Replace commands. Each <string> must be ended by a <CONTROL-Z> or a <RETURN> (see the Replace command for details). No spaces should be left between strings or between a string and its command letter, unless you want those spaces to be part of the string.

7.5 EDLIN COMMANDS

The following pages describe EDLIN editing commands.

NAME

Append

PURPOSE

Adds the specified number of lines from disk to the file being edited in memory. The lines are added at the end of lines that are currently in memory.

SYNTAX

[<n>]A

COMMENTS

This command is meaningful only if the file being edited is too large to fit into memory. As many lines as possible are read into memory for editing when you start EDLIN.

To edit the remainder of the file that will not fit into memory, lines that have already been edited must be written to disk. Then you can load unedited lines from disk into memory with the Append command. Refer to the Write command in this chapter for information on how to write edited lines to disk.

NOTES

1. If you do not specify the number of lines to append, lines will be appended to memory until available memory is 3/4 full. No action will be taken if available memory is already 3/4 full.
2. The message "End of input file" is displayed when the Append command has read the last line of the file into memory.

NAME

Copy

PURPOSE

Copies a range of lines to a specified line number. The lines can be copied as many times as you want by using the <count> option.

SYNTAX

[<line>],[<line>],<line>[,<count>]C

COMMENTS

If you do not specify a number in <count>, EDLIN copies the lines one time. If the first or the second <line> are omitted, the default is the current line. The file is renumbered automatically after the copy.

The line numbers must not overlap or you will get an "Entry error" message. For example, 3,20,15C would result in an error message.

EXAMPLES:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file
2: used to show copying lines.
3: See what happens when you use
4: the Copy command
5: (the C command)
6: to copy text in your file.
```

You can copy this entire block of text by issuing the following command:

1,6,7C

The result is:

```
1: This is a sample file
2: used to show copying lines.
3: See what happens when you use
4: the Copy command
5: (the C command)
6: to copy text in your file.
7: This is a sample file
8: used to show copying lines.
9: See what happens when you use
```


- 10: the Copy command
- 11: (the C command)
- 12: to copy text in your file.

If you want to place the text within other text, the third <line> option should specify the line before which you want the copied text to appear. For example, assume that you want to copy lines and insert them within the following file:

- 1: This is a sample file
- 2: used to show copying lines.
- 3: See what happens when you use
- 4: the Copy command
- 5: (the C command)
- 6: to copy text in your file.
- 7: You can also use COPY
- 8: to copy lines of text
- 9: to the middle of your file.
- 10: End of sample file.

The command 3,6,10C results in the following file:

- 1: This is a sample file
- 2: used to show copying lines.
- 3: See what happens when you use
- 4: the Copy command
- 5: (the C command)
- 6: to copy text in your file.
- 7: You can also use COPY
- 8: to copy lines of text
- 9: to the middle of your file.
- 10: See what happens when you use
- 11: the Copy command
- 12: (the C command)
- 13: to copy text in your file.
- 14: End of sample file.

NAME

Delete

PURPOSE

Deletes a specified range of lines in a file.

SYNTAX

[<line>][,<line>]D

COMMENTS

If the first <line> is omitted, that option will default to the current line (the line with the asterisk next to the line number). If the second <line> is omitted, then just the first <line> will be deleted. When lines have been deleted, the line immediately after the deleted section becomes the current line and has the same line number as the first deleted <line> had before the deletion occurred.

EXAMPLES:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
.
.
.
25: (the D and I commands)
26: to edit the text
27:*in your file.
```

To delete multiple lines, type

```
5,24D
```

The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7:*in your file.
```

To delete a single line, type:

6D

The result is:

- 1: This is a sample file
- 2: used to show dynamic line numbers.
- 3: See what happens when you use
- 4: Delete and Insert
- 5: (the D and I commands)
- 6:*in your file.

Next, delete a range of lines from the following file:

- 1: This is a sample file
- 2: used to show dynamic line numbers.
- 3:*See what happens when you use
- 4: Delete and Insert
- 5: (the D and I commands)
- 6: to edit text
- 7: in your file.

To delete a range of lines beginning with the current line, type:

,6D

The result is:

- 1: This is a sample file
- 2: used to show dynamic line numbers.
- 3:*in your file.

Notice that the lines are automatically renumbered.

NAME

Edit

PURPOSE

Edits line of text.

SYNTAX

[<line>]

COMMENTS

When a line number is typed, EDLIN displays the line number and text; then, on the line below, EDLIN reprints the line number. The line is now ready for editing. You may use any of the EDLIN editing commands to edit the line. The existing text of the line serves as the template until the <RETURN> key is pressed.

If no line number is typed (that is, if only the <RETURN> key is pressed), the line after the current line (marked with an asterisk (*)) is edited. If no changes to the current line are needed and the cursor is at the beginning or end of the line, press the <RETURN> key to accept the line as is.

WARNING

If the <RETURN> key is pressed while the cursor is in the middle of the line, the remainder of the line is deleted.

EXAMPLE:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file.  
2: used to show  
3: the editing of line  
4:*four.
```

To edit line 4, type:

4

The contents of the line are displayed with a

cursor below the line:

```
4:* four.
```

```
4:* _
```

Now, using the <COPYALL> special editing key,
type:

```
<INSERT>number      4: number_  
<COPYALL><RETURN>  4: number_four.  
                    5:* _
```

NAME

End

PURPOSE

Ends the editing session.

SYNTAX

E

COMMENTS

This command saves the edited file on disk, renames the original input file <filename>.BAK, and then exits EDLIN. If the file was created during the editing session, no .BAK file is created.

The E command takes no options. Therefore, you cannot tell EDLIN on which drive to save the file. The drive you want to save the file on must be selected when the editing session is started. If the drive is not selected when EDLIN is started, the file will be saved on the disk in the default drive. It will still be possible to COPY the file to a different drive using the MS-DOS COPY command.

You must be sure that the disk contains enough free space for the entire file. If the disk does not contain enough free space, the write will be aborted and the edited file lost, although part of the file might be written out to the disk.

EXAMPLE:

E<RETURN>

After execution of the E command, the MS-DOS default drive prompt (for example, A>) is displayed.

NAME

Insert

PURPOSE

Inserts text immediately before the specified <line>.

SYNTAX

[<line>]I

COMMENTS

If you are creating a new file, the I command must be given before text can be typed (inserted). Text begins with line number 1. Successive line numbers appear automatically each time <RETURN> is pressed.

EDLIN remains in insert mode until <CONTROL-C> is typed. When the insert is completed and insert mode has been exited, the line immediately following the inserted lines becomes the current line. All line numbers following the inserted section are incremented by the number of lines inserted.

If <line> is not specified, the default will be the current line number and the lines will be inserted immediately before the current line. If <line> is any number larger than the last line number, or if a pound sign (#) is specified as <line>, the inserted lines will be appended to the end of the file. In this case, the last line inserted will become the current line.

EXAMPLES:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7:*in your file.
```

To insert text before a specific line that is not the current line, type:

7I

The result is:

7: _

Now, type the new text for line 7:

7: and renumber lines

Then to end the insertion, press <CONTROL-Z> on the next line:

8: <CONTROL-Z>

Now type L to list the file. The result is:

1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7. and renumber lines
8:*in your file.

To insert lines immediately before the current line, type:

I

The result is:

8: _

Now, insert the following text and terminate with a <CONTROL-Z> on the next line:

8: so they are consecutive
9: <CONTROL-Z>

Now to list the file and see the result, type L:

The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7: and renumber lines
8: so they are consecutive
9:*in your file.
```

To append new lines to the end of the file,
type:

```
10I
```

This produces the following:

```
10: _
```

Now, type the following new lines:

```
10: The insert command can place new lines
11: in the file; there's no problem
12: because the line numbers are dynamic;
13: they'll go all the way to 65533.
```

End the insertion by pressing <CONTROL-Z> on
line 14. The new lines will appear at the end
of all previous lines in the file. Now type
the List command, L:

The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7: and renumber lines
8: so they are consecutive
9: in your file.
10: The insert command can place new lines
11: in the file; there's no problem
12: because the line numbers are dynamic;
13: they'll go all the way to 65533.
```

NAME

List

PURPOSE

Lists a range of lines, including the two lines specified.

SYNTAX

[<line>][,<line>]L

COMMENTS

Default values are provided if either one or both of the options are omitted. If you omit the first option, as in:

,<line>L

the display will start 11 lines before the current line and end with the specified <line>. The beginning comma is required to indicate the omitted first option.

NOTE

If the specified <line> is more than 11 lines before the current line, the display will be the same as if you omitted both options.

If you omit the second option, as in:

<line>L

23 lines will be displayed, starting with the specified <line>.

If you omit both parameters, as in:

L

23 lines will be displayed--the 11 lines before the current line, the current line, and the 11 lines after the current line. If there are less than 11 lines before the current line, more than 11 lines after the current line will be displayed to make a total of 23 lines.

EXAMPLES:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
.
.
.
15:*The current line contains an asterisk.
.
.
.
26: to edit text
27: in your file.
```

To list a range of lines without reference to the current line, type <line>,<line>L:

```
2,5L
```

The result is:

```
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
```

To list a range of lines beginning with the current line, type:

```
,26L
```

The result is:

```
15:*The current line contains an asterisk.
.
.
.
26: to edit text
```

To list a range of 23 lines centered around the current line, type only

L

The result is:

4: Delete and Insert

5: (the D and I commands)

.

.

.

13: The current line is listed in the middle of the range.

14: The current line remains unchanged by the L command.

15:*The current line contains an asterisk.

.

.

.

26: to edit text.

NAME

Move

PURPOSE

Moves a range of text to the line specified.

SYNTAX

[<line>],[<line>],<line>M

COMMENTS

Use the Move command to move a block of text (from the first <line> to the second <line>) to another location in the file. The lines are renumbered according to the direction of the move. For example:

,+25,100M

moves the text from the current line plus 25 lines to line 100. If the line numbers overlap, EDLIN will display an "Entry error" message.

To move lines 20-30 to line 100, type:

20,30,100M

NAME

Page

PURPOSE

Pages through a file 23 lines at a time.

SYNTAX

[<line>][,<line>]P

COMMENTS

If the first <line> is omitted, that number will default to the current line plus one. If the second <line> is omitted, 23 lines will be listed. The new current line becomes the last line displayed and is marked with an asterisk.

NAME

Quit

PURPOSE

Quits the editing session, does not save any editing changes, and exits to the MS-DOS operating system.

SYNTAX

Q

COMMENTS

EDLIN prompts you to make sure you don't want to save the changes.

Type Y if you want to quit the editing session. No editing changes are saved and no .BAK file is created. Refer to the End command in this chapter for information about the .BAK file.

Type N or any other character except Y if you want to continue the editing session.

NOTE

When started, EDLIN erases any previous copy of the file with an extension of .BAK to make room to save the new copy. If you reply Y to the Abort edit (Y/N)? message, your previous backup copy will no longer exist.

EXAMPLE:

```
Q
Abort edit (Y/N)?Y<RETURN>
A>_
```

NAME

Replace

PURPOSE

Replaces all occurrences of a string of text in the specified range with a different string of text or blanks.

SYNTAX

```
[<line>][,<line>][?]R<string1><CONTROL-Z>  
  <string2>
```

COMMENTS

As each occurrence of <string1> is found, it is replaced by <string2>. Each line in which a replacement occurs will be displayed. If a line contains two or more replacements of <string1> with <string2>, then the line will be displayed once for each occurrence. When all occurrences of <string1> in the specified range are replaced by <string2>, the R command terminates and the asterisk prompt reappears.

If a second string is to be given as a replacement, then <string1> must be separated from <string2> with a <CONTROL-Z>. <String2> must also be ended with a <CONTROL-Z><RETURN> combination or with a simple <RETURN>.

If <string1> is omitted, then Replace will take the old <string1> as its value. If there is no old <string1>, i.e., this is the first replace done, then the replacement process will be terminated immediately. If <string2> is omitted, then <string1> may be ended with a <RETURN>. If the first <line> is omitted in the range argument (as in ,<line>) then the first <line> will default to the line after the current line. If the second <line> is omitted (as in <line> or <line>,), the second <line> will default to #. Therefore, this is the same as <line>,#. Remember that # indicates the line after the last line of the file.

If <string1> is ended with a <CONTROL-Z> and there is no <string2>, <string2> will be taken as an empty string and will become the new replace string. For example:

```
R<string2><CONTROL-Z><RETURN>
```

will delete occurrences of <string1>, but


```
R<string1><return>    and  
R<RETURN>
```

will replace <string1> by the old <string2> and the old <string1> with the old <string2>, respectively. Note that "old" here refers to a previous string specified either in a Search or a Replace command.

If the question mark (?) option is given, the Replace command will stop at each line with a string that matches <string1>, display the line with <string2> in place, and then display the prompt O.K.?. If you press Y or the <RETURN> key, then <string2> will replace <string1>, and the next occurrence of <string1> will be found. Again, the O.K.? prompt will be displayed. This process will continue until the end of the range or until the end of the file. After the last occurrence of <string1> is found, EDLIN displays the asterisk prompt.

If you press any key besides Y or <RETURN> after the O.K.? prompt, the <string1> will be left as it was in the line, and Replace will go to the next occurrence of <string1>. If <string1> occurs more than once in a line, each occurrence of <string1> will be replaced individually, and the O.K.? prompt will be displayed after each replacement. In this way, only the desired <string1> will be replaced, and you can prevent unwanted substitutions.

EXAMPLES:

Assume that the following file exists and is ready for editing:

```
1: This is a sample file  
2: used to show dynamic line numbers.  
3: See what happens when you use  
4: Delete and Insert  
5: (the D and I commands)  
6: to edit text  
7: in your file.  
8: The insert command can place new lines  
9: in the file; there's no problem  
10: because the line numbers are dynamic;  
11: they'll go all the way to 65533.
```

To replace all occurrences of <string1> with <string2> in a specified range, type:

2,12 Rand<CONTROL-Z>or<RETURN>

The result is:

4: Delete or Insert
5: (the D or I commors)
8: The insert commor can place new lines

Note that in the above replacement, some unwanted substitutions have occurred. To avoid these and to confirm each replacement, the same original file can be used with a slightly different command.

In the next example, to replace only certain occurrences of the first <string> with the second <string>, type:

2? Rand<CONTROL-Z>or<RETURN>

The result is:

4: Delete or Insert
O.K.? Y
5: (The D or I commands)
O.K.? Y
5: (The D or I commors)
O.K.? N
8: The insert commor can place new lines
O.K.? N
*
—

Now, type the List command (L) to see the result of all these changes:

.
.
4: Delete or Insert
5: (The D or I commands)
.
8: The insert command can place new lines
.
.

NAME

Search

PURPOSE

Searches the specified range of lines for a specified string of text.

SYNTAX

[<line>][,<line>][?]S<string><RETURN>

COMMENTS

The <string> must be ended with a <RETURN>. The first line that matches <string> is displayed and becomes the current line. If the question mark option is not specified, the Search command will terminate when a match is found. If no line contains a match for <string>, the message "Not found" will be displayed.

If the question mark option (?) is included in the command, EDLIN will display the first line with a matching string; it will then prompt you with the message O.K.?. If you press either the Y or <RETURN> key, the line will become the current line and the search will terminate. If you press any other key, the search will continue until another match is found, or until all lines have been searched (and the Not found message is displayed).

If the first <line> is omitted (as in ,<line> S<string>), the first <line> will default to the line after the current line. If the second <line> is omitted (as in <line> S<string> or <line>, S<string>), the second <line> will default to # (line after last line of file), which is the same as <line>,# S<string>. If <string> is omitted, Search will take the old string if there is one. (Note that "old" here refers to a string specified in a previous Search or Replace command.) If there is not an old string (i.e., no previous search or replace has been done), the command will terminate immediately.

EXAMPLES:

Assume that the following file exists and is ready for editing:

1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7: in your file.
8: The insert command can place new lines
9: in the file; there's no problem
10: because the line numbers are dynamic;
11:*they'll go all the way to 65533.

To search for the first occurrence of the string "and", type:

2,12 Sand<RETURN>

The following line is displayed:

4: Delete and Insert

To get the "and" in line 5, modify the search command by typing:

<SKIPl><COPYALL>,12 Sand<RETURN>

The search then continues from the line after the current line (line 4), since no first line was given. The result is:

5: (the D and I commands)

To search through several occurrences of a string until the correct string is found, type:

1, ? Sand

The result is:

4: Delete and Insert
O.K.?_

If you press any key (except Y or <RETURN>), the search continues, so type N here:

O.K.? N

Continue:

5: (the D and I commands)
O.K.?_

Now press Y to terminate the search:

O.K.? Y

*
—

To search for string XYZ without the
verification (O.K.), type:

SXYZ

EDLIN will report a match and will continue to
search for the same string when you issue the S
command:

S

EDLIN reports another match.

S

EDLIN reports the string is not found.

Note that <string> defaults to any string
specified by a previous Replace or Search
command.

NAME

Transfer

PURPOSE

Inserts (merges) the contents of <filename> into the file currently being edited at <line>. If <line> is omitted, then the current line will be used.

SYNTAX

[<line>]T<filename>

COMMENTS

This command is useful if you want to put the contents of a file into another file or into the text you are typing. The transferred text is inserted at the line number specified by <line> and the lines are renumbered.

NAME

Write

PURPOSE

Writes a specified number of lines to disk from the lines that are being edited in memory. Lines are written to disk beginning with line number 1.

SYNTAX

[<n>]W

COMMENTS

This command is meaningful only if the file you are editing is too large to fit into memory. When you start EDLIN, EDLIN reads lines into memory until memory is 3/4 full.

To edit the remainder of your file, you must write edited lines in memory to disk. Then you can load additional unedited lines from disk into memory by using the Append command.

NOTE

If you do not specify the number of lines, lines will be written until memory is 3/4 full. No action will be taken if available memory is already more than 3/4 full. All lines are renumbered, so that the first remaining line becomes line number 1.

7.6 ERROR MESSAGES

When EDLIN finds an error, one of the following error messages is displayed:

Cannot edit .BAK file--rename file

Cause: You attempted to edit a file with a filename extension of .BAK. .BAK files cannot be edited because this extension is reserved for backup copies.

Cure: If you need the .BAK file for editing purposes, you must either RENAME the file with a different extension; or COPY the .BAK file and give it a different filename extension.

No room in directory for file

Cause: When you attempted to create a new file, either the file directory was full or you specified an illegal disk drive or an illegal filename.

Cure: Check the command line that started EDLIN for illegal filename and illegal disk drive entries. If the command is no longer on the screen and if you have not yet typed a new command, the EDLIN start command can be recovered by pressing the <COPYALL> key.

If this command line contains no illegal entries, run the CHKDSK program for the specified disk drive. If the status report shows that the disk directory is full, remove the disk. Insert and format a new disk.

Entry Error

Cause: The last command typed contained a syntax error.

Cure: Retype the command with the correct syntax and press <RETURN>.

Line too long

Cause: During a Replace command, the string given as the replacement caused the line to expand beyond the limit of 253 characters. EDLIN aborted the Replace command.

Cure: Divide the long line into two lines, then try the Replace command twice.

Disk Full--file write not completed

Cause: You gave the End command, but the disk did not contain enough free space for the whole file. EDLIN aborted the E command and returned you to the operating system. Some of the file may have been written to the disk.

Cure: Only a portion (if any) of the file has been saved. You should probably delete that portion of the file and restart the editing session. The file will not be available after this error. Always be sure that the disk has sufficient free space for the file to be written to disk before you begin your editing session.

Incorrect DOS version

Cause: You attempted to run EDLIN under a version of MS-DOS that was not 2.0 or higher.

Cure: You must make sure that the version of MS-DOS that you are using is 2.0 or higher.

Invalid drive name or file

Cause: You have not specified a valid drive or filename when starting EDLIN.

Cure: Specify the correct drive or filename.

Filename must be specified

Cause: You did not specify a filename when you started EDLIN.

Cure: Specify a filename.

Invalid Parameter

Cause: You specified a switch other than /B when starting EDLIN.

Cure: Specify the /B switch when you start EDLIN.

Insufficient memory

Cause: There is not enough memory to run EDLIN.

Cure: You must free some memory by writing files to disk or by deleting files before restarting EDLIN. Type a Write command and then an Append command to free memory.

File not found

Cause: The filename specified during a Transfer command was not found.

Cure: Specify a valid filename when issuing a Transfer command.

Must specify destination number

Cause: A destination line number was not specified for a Copy or Move command.

Cure: Reissue the command with a destination line number.

Not enough room to merge the entire file

Cause: There was not enough room in memory to hold the file during a Transfer command.

Cure: You must free some memory by writing some files to disk or by deleting some files before you can transfer this file.

File creation error

Cause: The EDLIN temporary file cannot be created.

Cure: Check to make sure that the directory has enough space to create the temporary file. Also, make sure that the file does not have the same name as a subdirectory in the directory where the file to be edited is located.

CHAPTER 8

FILE COMPARISON UTILITY (FC)

Introduction

Limitations On Source Comparisons

File Specifications

How To Use FC

FC Switches

Difference Reporting

Redirecting FC Output To A File

Examples

Error Messages

8.1 INTRODUCTION

It is sometimes useful to compare files on your disk. If you have copied a file and later want to compare copies to see which one is current, you can use the MS-DOS File Comparison Utility (FC).

The File Comparison Utility compares the contents of two files. The differences between the two files can be output to the console or to a third file. The files being compared may be either source files (files containing source statements of a programming language); or binary (files output by the MACRO-86 assembler, the MS-LINK Linker utility, or by a Microsoft high-level language compiler).

The comparisons are made in one of two ways: on a line-by-line or a byte-by-byte basis. The line-by-line comparison isolates blocks of lines that are different between the two files and prints those blocks of lines. The byte-by-byte comparison displays the bytes that are different between the two files.

8.1.1 Limitations On Source Comparisons

FC uses a large amount of memory as buffer (storage) space to hold the source files. If the source files are larger than available memory, FC will compare what can be loaded into the buffer space. If no match is found in the portions of the files in the buffer space, FC will display only the message:

*** Files are different ***

For binary files larger than available memory, FC compares both files completely, overlaying the portion in memory with the next portion from disk. All differences are output in the same manner as those files that fit completely in memory.

8.2 FILE SPECIFICATIONS

All file specifications use the following syntax:

[d:]<filename>[<.ext>]

where: d: is the letter designating a disk drive. If the drive designation is omitted, FC defaults to the operating system's (current) default drive.

filename is a one- to eight-character name of the file.

.ext is a one- to three-character extension to the filename.

8.3 HOW TO USE FC

The syntax of FC is as follows:

```
FC [/# /B /W /C] <filename1> <filename2>
```

FC matches the first file (filename1) against the second (filename2) and reports any differences between them. Both filenames can be pathnames. For example:

```
FC B:\FOO\BAR\FILE1.TXT \BAR\FILE2.TXT
```

FC takes FILE1.TXT in the \FOO\BAR directory of disk drive B: and compares it with FILE2.TXT in the \BAR directory. Since no drive is specified for filename2, FC assumes that the \BAR directory is on the disk in the default drive.

8.4 FC SWITCHES

There are four switches that you can use with the File Comparison Utility:

/B Forces a binary comparison of both files. The two files are compared byte-to-byte, with no attempt to re-synchronize after a mismatch. The mismatches are printed as follows:

```
--ADDRS----F1----F2-
xxxxxxxx yy zz
```

(where xxxxxxxx is the relative address of the pair of bytes from the beginning of the file). Addresses start at 00000000; yy and zz are the mismatched bytes from file1 and file2, respectively. If one of the files contains less data than the other, then a message is printed out. For example, if file1 ends before file2, then FC displays:

Data left in F2

/# # stands for a number from 1 to 9. This switch specifies the number of lines required to match for the files to be considered as matching again after a difference has been found. If this switch is not specified, it defaults to 3. This switch is used only in source comparisons.

/W Causes FC to compress whites (tabs and spaces) during the comparison. Thus, multiple contiguous whites in any line will be considered as a single white space. Note that although FC compresses whites, it does not ignore them. The two exceptions are beginning and ending whites in a line, which are ignored. For example (note that an underscore represents a white):

___More__data_to_be_found___

will match with:

More_data_to_be_found

and with:

_____More_____data_to_be_____found_____

but will not match with:

___Moredata_to_be_found

This switch is used only in source comparisons.

/C Causes the matching process to ignore the case of letters. All letters in the files are considered uppercase letters. For example:

Much_MORE_data_IS_NOT_FOUND

will match:

much_more_data_is_not_found

If both the /W and /C options are specified, then FC will compress whites and ignore case. For example:

___DATA_was_found___

will match:

data_was_found

This switch is used only in source comparisons.

8.5 DIFFERENCE REPORTING

The File Comparison Utility reports the differences between the two files you specify by displaying the first filename, followed by the lines that differ between the files, followed by the first line to match in both files. FC then displays the name of the second file followed by the lines that are different, followed by the first line that matches. The default for the number of lines to match between the files is 3. (If you want to change this default, specify the number of lines with the /# switch.) For example:

```
...
...
-----<filename1>
<difference>
<1st line to match file2 in file1>

-----<filename2>
<difference>
<1st line to match file1 in file2>

-----
...
...
```

FC will continue to list each difference.

If there are too many differences (involving too many lines), the program will simply report that the files are different and stop.

If no matches are found after the first difference is found, FC will display:

```
*** Files are different ***
```

and will return to the MS-DOS default drive prompt (for example, A>).

8.6 REDIRECTING FC OUTPUT TO A FILE

The differences and matches between the two files you specify will be displayed on your screen unless you redirect the output to a file. This is accomplished in the same way as MS-DOS command redirection (refer to Chapter 4, "Learning About Commands").

To compare File1 and File2 and then send the FC output to DIFFER.TXT, type:

```
FC File1 File2 >DIFFER.TXT
```

The differences and matches between File1 and File2 will be put into DIFFER.TXT on the default drive.

8.7 EXAMPLES

Example 1:

Assume these two ASCII files are on disk:

ALPHA.ASM	BETA.ASM
FILE A	FILE B
-----	-----
A	A
B	B
C	C
D	G
E	H
F	I
G	J
H	l
I	2
M	P
N	Q
O	R
P	S
Q	T
R	U
S	V
T	4
U	5
V	W
W	X
X	Y
Y	Z
Z	

To compare the two files and display the differences on the terminal screen, type:

FC ALPHA.ASM BETA.ASM

FC compares ALPHA.ASM with BETA.ASM and displays the differences on the terminal screen. All other defaults remain intact. (The defaults are: do not compress whites and do not ignore case.)

The output will appear as follows on the terminal screen (the Notes do not appear):

-----ALPHA.ASM

D NOTE: ALPHA file
E contains defg,
F BETA contains g.
G

-----BETA.ASM

G

-----ALPHA.ASM

M NOTE: ALPHA file
N contains mno where
O BETA contains jl2.
P

-----BETA.ASM

J
1
2
P

-----ALPHA.ASM

W NOTE: ALPHA file
contains w where
-----BETA.ASM BETA contains 45w.

4
5
W

Example 2:

You can print the differences on the line printer using the same two source files. In this example, four successive lines must be the same to constitute a match.

Type:

```
FC /4 ALPHA.ASM BETA.ASM >PRN
```

The following output will appear on the line printer:

```
-----ALPHA.ASM
```

```
D
E
F
G
H
I
M
N
O
P
```

```
NOTE: p is the 1st of
a string of 4 matches.
```

```
-----BETA.ASM
```

```
G
H
I
J
1
2
P
```

```
-----ALPHA.ASM
```

```
W
```

```
NOTE: w is the 1st of a
string of 4 matches.
```

```
-----BETA.ASM
```

```
4
5
W
```

Example 3:

This example forces a binary comparison and then displays the differences on the terminal screen using the same two source files as were used in the previous examples.

Type:

FC /B ALPHA.ASM BETA.ASM

The /B switch in this example forces binary comparison. This switch and any others must be typed before the filenames in the FC command line. The following display should appear:

```
--ADDRS----F1--F2--
00000009    44    47
0000000C    45    48
0000000F    46    49
00000012    47    4A
00000015    48    31
00000018    49    32
0000001B    4D    50
0000001E    4E    51
00000021    4F    52
00000024    50    53
00000027    51    54
0000002A    52    55
0000002D    53    56
00000030    54    34
00000033    55    35
00000036    56    57
00000039    57    58
0000003C    58    59
0000003F    59    5A
00000042    5A    1A
```

8.8 ERROR MESSAGES

When the File Comparison Utility detects an error, one or more of the following error messages will be displayed:

Bad file

One of the files you specified is defective.

Data left in (filename)

After reaching the end of one of the files in a file comparison, the other file still has uncomparing data left.

File not found:<filename>

FC could not find the filename you specified.

Incorrect DOS version

You are running FC under a version of MS-DOS that is not 2.0 or higher.

Internal error

This message indicates an internal logic error in the FC utility.

Invalid number of parameters

You have specified the wrong number of options on the FC command line.

Invalid parameter:<option>

One of the switches that you have specified is invalid.

Read error in:<filename>

FC could not read the entire file.

CHAPTER 9

THE LINKER PROGRAM (MS-LINK)

Introduction

Overview Of MS-LINK

Definitions You'll Need To Know

Files That MS-LINK Uses

 Input File Extensions

 Output File Extensions

 VM.TMP (Temporary) File

How To Start MS-LINK

 Method 1: Prompts

 Method 2: Command Line

 Method 3: Response File

Command Characters

Command Prompts

MS-LINK Switches

Sample MS-LINK Session

Error Messages

9.1 INTRODUCTION

In this chapter you will learn about MS-LINK. It is recommended that you read the entire chapter before you use MS-LINK.

NOTE

If you are not going to compile and link programs, you do not need to read this chapter.

The MS-DOS linker (called MS-LINK) is a program that:

1. Combines separately produced object modules into one relocatable load module--a program you can run
2. Searches library files for definitions of unresolved external references
3. Resolves external cross-references
4. Produces a listing that shows both the resolution of external references and error messages

9.2 OVERVIEW OF MS-LINK

When you write a program, you write it in source code. This source code is passed through a compiler which produces object modules. The object modules must be passed through the link process to produce machine language that the computer can understand directly. This machine language is in the form required for running programs.

You may wish to link (combine) several programs and run them together. Each of your programs may refer to a symbol that is defined in another object module. This reference is called an external reference.

MS-LINK combines several object modules into one relocatable load module, or Run file (called an .EXE or Executable file). As it combines modules, MS-LINK makes sure that all external references between object modules are defined. MS-LINK can search several library files for definitions of any external references that are not defined in the object modules.

MS-LINK also produces a List file that shows external references resolved, and it also displays any error messages.

MS-LINK uses available memory as much as possible. When available memory is exhausted, MS-LINK creates a temporary disk file named VM.TMP.

Figure 9 illustrates the various parts of the MS-LINK operation:

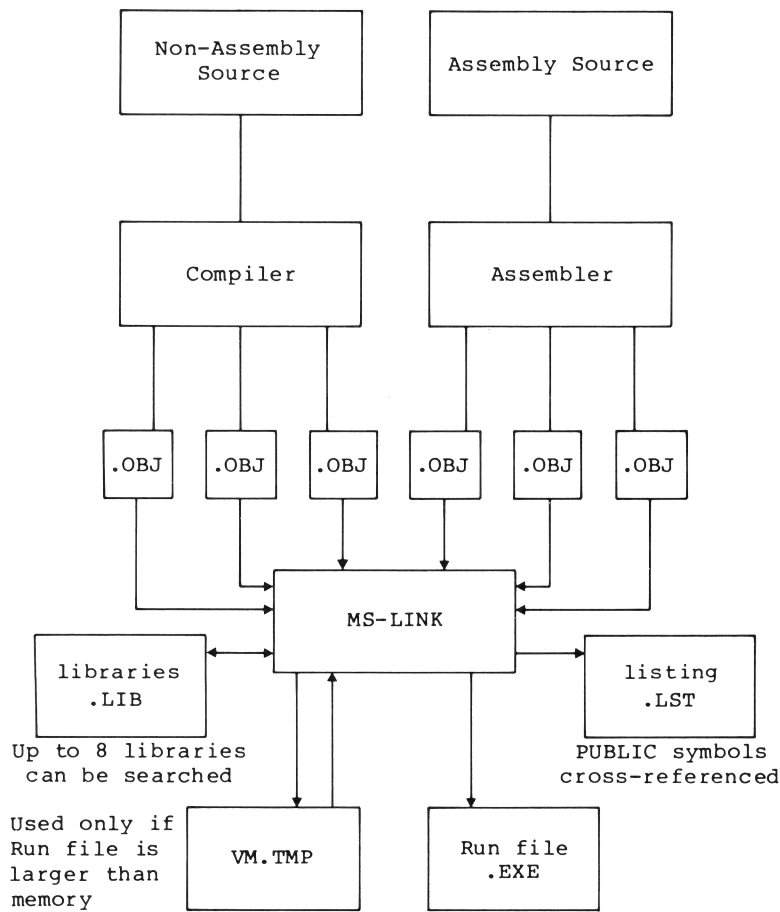
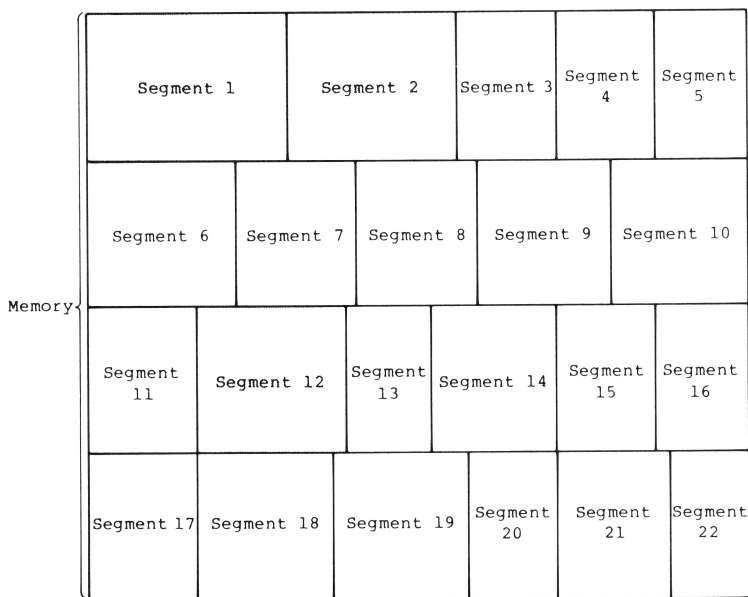


Figure 9. The MS-LINK Operation

9.3 DEFINITIONS YOU'LL NEED TO KNOW

Some of the terms used in this chapter are explained below to help you understand how MS-LINK works. Generally, if you are linking object modules compiled from BASIC, Pascal, or a high-level language, you will not need to know these terms. If you are writing and compiling programs in assembly language, however, you will need to understand MS-LINK and the definitions described below.

In MS-DOS, memory can be divided into segments, classes, and groups. Figure 10 illustrates these concepts:



shaded area = a group (64K bytes addressable)

Figure 10. How Memory Is Divided

Example:

	Segment Name	Segment Class Name
-----	-----	-----
Segment 1	PROG.1	CODE
Segment 2	PROG.2	CODE
Segment 12	PROG.3	DATA

Note that segments 1, 2, and 12 have different segment names but may or may not have the same segment class name. Segments 1, 2, and 12 form a group with a group address of the lowest address of segment 1 (i.e., the lowest address in memory).

Each segment has a segment name and a class name. MS-LINK loads all segments into memory by class name from the first segment encountered to the last. All segments assigned to the same class are loaded into memory contiguously.

During processing, MS-LINK references segments by their addresses in memory (where they are located). MS-LINK does this by finding groups of segments.

A group is a collection of segments that fit within a 64K byte area of memory. The segments do not need to be contiguous to form a group (see illustration). The address of any group is the lowest address of the segments in that group. At link time, MS-LINK analyzes the groups, then references the segments by the address in memory of that group. A program may consist of one or more groups.

If you are writing in assembly language, you may assign the group and class names in your program. In high-level languages (BASIC, COBOL, FORTRAN, Pascal), the naming is done automatically by the compiler.

9.4 FILES THAT MS-LINK USES

MS-LINK:

1. Works with one or more input files
2. Produces two output files
3. May create a temporary disk file
4. May be directed to search up to eight library files

For each type of file, the user may give a three-part file specification. The format for MS-LINK file specifications is the same as that of a disk file:

[d:]<filename>[<.ext>]

where: d: is the drive designation. Permissible drive designations for MS-LINK are A: through O:. The colon is always required as part of the drive designation.

filename is any legal filename of one to eight characters.

.ext is a one- to three-character extension to the filename. The period is always required as part of the extension.

9.4.1 Input File Extensions

If no filename extensions are given in the input (object) file specifications, MS-LINK will recognize the following extensions by default:

.OBJ	Object
.LIB	Library

9.4.2 Output File Extensions

MS-LINK appends the following default extensions to the output (Run and List) files:

.EXE	Run (may not be overridden)
.MAP	List (may be overridden)

9.4.3 VM.TMP (Temporary) File

MS-LINK uses available memory for the link session. If the files to be linked create an output file that exceeds available memory, MS-LINK will create a temporary file, name it VM.TMP, and put it on the disk in the default drive. If MS-LINK creates VM.TMP, it will display the message:

```
VM.TMP has been created.  
Do not change diskette in drive, <d:>
```

Once this message has been displayed, you must not remove the disk from the default drive until the link session ends. If the disk is removed, the operation of MS-LINK will be unpredictable, and MS-LINK might display the error message:

```
Unexpected end of file on VM.TMP
```

The contents of VM.TMP are written to the file named following the Run File: prompt. VM.TMP is a working file only and is deleted at the end of the linking session.

WARNING

```
Do not use VM.TMP as a  
filename for any file. If you  
have a file named VM.TMP on  
the default drive and MS-LINK  
requires the VM.TMP file,  
MS-LINK will delete the VM.TMP  
already on disk and create a  
new VM.TMP. Thus, the  
contents of the previous  
VM.TMP file will be lost.
```

9.5 HOW TO START MS-LINK

MS-LINK requires two types of input: a command to start MS-LINK and responses to command prompts. In addition, seven switches control MS-LINK features. Usually, you will type all the commands to MS-LINK on the terminal keyboard. As an option, answers to the command prompts and any switches may be contained in a response file. Command characters can be used to assist you while giving commands to MS-LINK.

MS-LINK may be started in any of three ways. The first method is to type the commands in response to individual prompts. In the second method, you type all commands on the line used to start MS-LINK. To start MS-LINK by the third method, you must create a response file that contains all the necessary commands and tell MS-LINK where that file is when you start MS-LINK.

Summary of Methods to Start MS-LINK

```
=====
Method 1          LINK
Method 2          LINK <filenames>[/switches]
Method 3          LINK @<filespec>
=====
```

9.5.1 Method 1: Prompts

To start MS-LINK with Method 1, type:

LINK

MS-LINK will be loaded into memory. MS-LINK will then display four text prompts that appear one at a time. You answer the prompts to command MS-LINK to perform specific tasks.

At the end of each line, you may type one or more switches, preceded by the switch character, a forward slash.

The command prompts are summarized below and described in more detail in the "Command Prompts" section.

PROMPT

RESPONSES

Object Modules [.OBJ]:

List .OBJ files to be linked. They must be separated by blank spaces or plus signs (+). If a plus sign is the last character typed, the prompt will reappear. There is no default; a response is required.

Run File [Object-file.EXE]:

Give filename for executable object code. The default is first-object-filename.EXE. (You cannot change the output extension.)

List File [Run-file.MAP]:

Give filename for listing. The default is RUN filename.

Libraries []:

List filenames to be searched, separated by blank spaces or plus signs (+). If a plus sign is the last character typed, the prompt will reappear. The default is to search for default libraries in the object modules. (Extensions will be changed to .LIB.)

9.5.2 Method 2: Command Line

To start MS-LINK using Method 2, type all commands on one line. The entries following LINK are responses to the command prompts. The entry fields for the different prompts must be separated by commas. Use the following syntax:

```
LINK <object-list>,<runfile>,<listfile>,<lib-list>[/switch...]
```

The entries following LINK are responses to the command prompts. The entry fields for the different prompts must be separated by commas.

where: object-list is a list of object modules, separated by plus signs.

runfile is the name of the file to receive the executable output.

listfile is the name of the file to receive the listing.

lib-list is a list of library modules to be searched.

/switch refers to optional switches, which may be placed following any of the response entries (just before any of the commas or after the <lib-list>, as shown).

To select the default for a field, simply type a second comma with no spaces between the two commas.

Example:

```
LINK  
FUN+TEXT+TABLE+CARE/P/M,,FUNLIST,COBLIB.LIB
```

This command causes MS-LINK to be loaded, then the object modules FUN.OBJ, TEXT.OBJ, TABLE.OBJ, and CARE.OBJ are loaded. MS-LINK then pauses (as a result of using the /P switch). MS-LINK links the object modules when you press any key, and produces a global symbol map (the /M switch); defaults to FUN.EXE Run file; creates a List file named FUNLIST.MAP; and searches the Library file COBLIB.LIB.

9.5.3 Method 3: Response File

To start MS-LINK with Method 3, type:

```
LINK @<filespec>
```

where: filespec is the name of a response file. A response file contains answers to the MS-LINK prompts (shown in Method 1) and may also contain any of the switches. When naming a response file, the use of filename extensions is optional. Method 3 permits the command that starts MS-LINK to be entered from the keyboard or within a batch file without requiring you to take any further action.

To use this option, you must create a response file containing several lines of text, each of which is the response to an MS-LINK prompt. The responses must be in the same order as the MS-LINK prompts discussed in Method 1. If desired, a long response to the Object Modules: or Libraries: prompt may be typed on several lines by using a plus sign (+) to continue the same response onto the next line.

Use switches and command characters in the response file the same way as they are used for responses typed on the terminal keyboard.

When the MS-LINK session begins, each prompt will be displayed in order with the responses from the response file. If the response file does not contain answers for all the prompts, (in the form of filenames, the semicolon command character or carriage returns), MS-LINK will display the prompt which does not have a response, then wait for you to type a legal response. When a legal response has been typed, MS-LINK continues the link session.

Example:

```
FUN TEXT TABLE CARE
/PAUSE/MAP
FUNLIST
COBLIB.LIB
```

This response file tells MS-LINK to load the four object modules named FUN, TEXT, TABLE, and CARE. MS-LINK pauses before producing a public symbol map to permit you to swap disks (see discussion under /PAUSE in the "Switches" section before using this feature). When you press any key, the output files will be named FUN.EXE and FUNLIST.MAP. MS-LINK will search the library file COBLIB.LIB, and will use the default settings for the switches.

9.6 COMMAND CHARACTERS

MS-LINK provides three command characters:

Plus sign Use the plus sign (+) to separate entries and to extend the current line in response to the Object Modules: and Libraries: prompts. (A blank space may be used to separate object modules.) To type a large number of responses (each may be very long), type a plus sign/<RETURN> at the end of the line to extend it. If the plus sign/<RETURN> is the last entry following these two prompts, MS-LINK will prompt you for more module names. When the Object Modules: or Libraries: prompt appears again, continue to type responses. When all the modules to be linked and libraries to be searched have been listed, be sure the response line ends with a module name and a <RETURN> and not a plus sign/<RETURN>.

Example:

```
Object Modules [.OBJ]: FUN TEXT TABLE  
CARE+<RETURN>  
Object Modules [.OBJ]:  
FOO+FLIPFLOP+JUNQUE+<RETURN>  
Object Modules [.OBJ]: CORSAIR<RETURN>
```

Semicolon To select default responses to the remaining prompts, use a single semicolon (;) followed immediately by a carriage return at any time after the first prompt (Run File:). This feature saves time and overrides the need to press a series of <RETURN> keys.

NOTE

Once the semicolon has been typed and entered (by pressing the <RETURN> key), you can no longer respond to any of the prompts for that link session. Therefore, do not use the semicolon to skip some prompts. To skip prompts, use the <RETURN> key.

Example:

```
Object Modules
[.OBJ]: FUN TEXT TABLE CARE<RETURN>
Run Module [FUN.EXE]: ;<RETURN>
```

No other prompts will appear, and MS-LINK will use the default values (including FUN.MAP for the List file).

<CONTROL-C> Use the <CONTROL-C> key to abort the link session at any time. If you type an erroneous response, such as the wrong filename or an incorrectly spelled filename, you must press <CONTROL-C> to exit MS-LINK then restart MS-LINK. If the error has been typed but you have not pressed the <RETURN> key, you may delete the erroneous characters with the backspace key, but for that line only.

9.7 COMMAND PROMPTS

MS-LINK asks you for responses to four text prompts. When you have typed a response to a prompt and pressed <RETURN>, the next prompt appears. When the last prompt has been answered, MS-LINK begins linking automatically without further command. When the link session is finished, MS-LINK exits to the operating system. When the operating system prompt appears, MS-LINK has finished successfully. If the link session is unsuccessful, MS-LINK will display the appropriate error message.

MS-LINK prompts you for the names of Object, Run, and List files, and for Libraries. The prompts are listed in order of appearance. The default response is shown in square brackets ([]) following the prompt, for prompts which can default to preset responses. The Object Modules: prompt has no preset filename response and requires you to type a filename.

Object Modules [.OBJ]:

Type a list of the object modules to be linked. MS-LINK assumes by default that the filename extension is .OBJ. If an object module has any other filename extension, the extension must be given. Otherwise, the extension may be omitted.

Modules must be separated by plus signs (+).

Remember that MS-LINK loads segments into classes in the order encountered. You can use this information to set the order in which the object modules will be read by MS-LINK.

Run File [First-Object-filename.EXE]:

Typing a filename will create a file for storing the Run (executable) file that results from the link session. All Run files receive the filename extension .EXE, even if you specify an extension other than .EXE.

If no response is typed to the Run File: prompt, MS-LINK uses the first filename typed in response to the Object Modules: prompt as the RUN filename.

Example:

Run File [FUN.EXE]: B:PAYROLL/P

This response directs MS-LINK to create the Run file PAYROLL.EXE on drive B:. Also, MS-LINK will pause, which allows you to insert a new disk to receive the Run file.

List File [Run-Filename.MAP]:

The List file contains an entry for each segment in the input (object) modules. Each entry also shows the addressing in the Run file.

The default response is the Run filename with the default filename extension .MAP.

Libraries []:

The valid responses are up to eight library filenames or simply a carriage return. (A carriage return means default library search.) Library files must have been created by a library utility. MS-LINK assumes that by default that the filename extension is .LIB for library files.

Library filenames must be separated by blank spaces or plus signs (+).

MS-LINK searches library files in the order listed to resolve external references. When it finds the module that defines the external symbol, MS-LINK processes that module as another object module.

If MS-LINK cannot find a library file on the disks in the disk drives, it will display the message:

Cannot find library <library-name>
Type new drive letter:

Press the letter for the drive designation
(for example, B).

9.8 MS-LINK SWITCHES

The seven MS-LINK switches control various MS-LINK functions. Switches must be typed at the end of a prompt response, regardless of which method is used to start MS-LINK. Switches may be grouped at the end of any response, or may be scattered at the end of several. If more than one switch is typed at the end of one response, each switch must be preceded by a forward slash (/).

All switches may be abbreviated. The only restriction is that an abbreviation must be sequential from the first letter through the last typed; no gaps or transpositions are allowed. For example:

Legal

/D
/DS
/DSA
/DSALLOCA

Illegal

/DSL
/DAL
/DLC
/DSALLOCT

/DSALLOCATE

Using the /DSALLOCATE switch tells MS-LINK to load all data at the high end of the Data Segment. Otherwise, MS-LINK loads all data at the low end of the Data Segment. At runtime, the DS pointer is set to the lowest possible address to allow the entire DS segment to be used. Use of the /DSALLOCATE switch in combination with the default load low (that is, the /HIGH switch is not used) permits the user application to dynamically allocate any available memory below the area specifically allocated within DGroup, yet to remain addressable by the same DS pointer. This dynamic allocation is needed for Pascal and FORTRAN programs.

NOTE

Your application program may dynamically allocate up to 64K bytes (or the actual amount of memory available) less the amount allocated within DGroup.

/HIGH

Use of the /HIGH switch causes MS-LINK to place the Run file as high as possible in memory. Otherwise, MS-LINK places the Run file as low as possible.

IMPORTANT

Do not use the /HIGH switch with Pascal or FORTRAN programs.

/LINENUMBERS

The /LINENUMBERS switch tells MS-LINK to include in the List file the line numbers and addresses of the source statements in the input modules. Otherwise, line numbers are not included in the List file.

NOTE

Not all compilers produce object modules that contain line number information. In these cases, of course, MS-LINK cannot include line numbers.

/MAP

/MAP directs MS-LINK to list all public (global) symbols defined in the input modules. If /MAP is not given, MS-LINK will list only errors (including undefined globals).

The symbols are listed alphabetically. For each symbol, MS-LINK lists its value and its segment:offset location in the Run file. The symbols are listed at the end of the List file.

/PAUSE

The /PAUSE switch causes MS-LINK to pause in the link session when the switch is encountered. Normally, MS-LINK performs the linking session from beginning to end without stopping. This switch allows the user to swap the disks before MS-LINK outputs the Run (.EXE) file.

When MS-LINK encounters the /PAUSE switch, it displays the message:

```
        About to generate .EXE file
        Change disks <hit any key>
```

MS-LINK resumes processing when the user presses any key.

CAUTION

Do not remove the disk which will receive the List file, or the disk used for the VM.TMP file, if one has been created.

/STACK:<number>

number represents any positive numeric value (in hexadecimal radix) up to 65536 bytes. If a value from 1 to 511 is typed, MS-LINK will use 512. If the /STACK switch is not used for a link session, MS-LINK will calculate the necessary stack size automatically.

All compilers and assemblers should provide information in the object modules that allow the linker to compute the required stack size.

At least one object (input) module must contain a stack allocation statement. If not, MS-LINK will display the following error message:

WARNING: NO STACK STATEMENT

/NO

/NO is short for NODEFAULTLIBRARYSEARCH. This switch tells MS-LINK to not search the default (product) libraries in the object modules. For example, if you are linking object modules in Pascal, specifying the /NO switch tells MS-LINK to not automatically search the library named PASCAL.LIB to resolve external references.

9.9 SAMPLE MS-LINK SESSION

This sample shows you the type of information that is displayed during an MS-LINK session.

In response to the MS-DOS prompt, type:

LINK

The system displays the following messages and prompts (your answers are underlined):

Microsoft Object Linker V.2.00
(C) Copyright 1982 by Microsoft Inc.

Object Modules [.OBJ]: IO SYSINIT
Run File [IO.EXE]:
List File [NUL.MAP]: IO /MAP
Libraries [.LIB]: ;

Notes:

1. By specifying /MAP, you get both an alphabetic listing and a chronological listing of public symbols.
2. By responding PRN to the List File: prompt, you can redirect your output to the printer.
3. By specifying the /LINE switch, MS-LINK gives you a listing of all line numbers for all modules. (Note that the /LINE switch can generate a large volume of output.)
4. By pressing <RETURN> in response to the Libraries: prompt, an automatic library search is performed.

Once MS-LINK locates all libraries, the linker map displays a list of segments in the order of their appearance within the load module. The list might look like this:

Start	Stop	Length	Name
00000H	009ECH	09EDH	CODE
009F0H	01166H	0777H	SYSINITSEG

The information in the Start and Stop columns shows the 20-bit hex address of each segment relative to location zero. Location zero is the beginning of the load module.

The addresses displayed are not the absolute addresses where these segments are loaded. Consult the MS-DOS 2.0 Macro Assembler Manual for information on how to determine where relative zero is actually located, and also on how to determine the absolute address of a segment.

Because the /MAP switch was used, MS-LINK displays the public symbols by name and value. For example:

ADDRESS	PUBLICS BY NAME
009F:0012	BUFFERS
009F:0005	CURRENT_DOS_LOCATION
009F:0011	DEFAULT_DRIVE
009F:000B	DEVICE_LIST
009F:0013	FILES
009F:0009	FINAL_DOS_LOCATION
009F:000F	MEMORY_SIZE
009F:0000	SYSINIT

ADDRESS	PUBLICS BY VALUE
009F:0000	SYSINIT
009F:0005	CURRENT_DOS_LOCATION
009F:0009	FINAL_DOS_LOCATION
009F:000B	DEVICE_LIST
009F:000F	MEMORY_SIZE
009F:0011	DEFAULT_DRIVE
009F:0012	BUFFERS
009F:0013	FILES

9.10 ERROR MESSAGES

All errors cause the link session to abort. After the cause has been found and corrected, MS-LINK must be rerun. The following error messages are displayed by MS-LINK:

Attempt to access data outside of segment bounds, possibly bad object module

There is probably a bad Object file.

Bad numeric parameter

Numeric value is not in digits.

Cannot open temporary file

MS-LINK is unable to create the file VM.TMP because the disk directory is full. Insert a new disk. Do not remove the disk that will receive the List.MAP file.

Error: dup record too complex

DUP record in assembly language module is too complex. Simplify DUP record in assembly language program.

Error: fixup offset exceeds field width

An assembly language instruction refers to an address with a short instruction instead of a long instruction. Edit assembly language source and reassemble.

Input file read error

There is probably a bad Object file.

Invalid object module

An object module(s) is incorrectly formed or incomplete (as when assembly is stopped in the middle).

Symbol defined more than once

MS-LINK found two or more modules that define a single symbol name.

Program size or number of segments exceeds capacity of linker

The total size may not exceed 384K bytes and the number of segments may not exceed 255.

Requested stack size exceeds 64k
Specify a size greater than or equal to 64K bytes
with the /STACK switch.

Segment size exceeds 64k
64K bytes is the addressing system limit.

Symbol table capacity exceeded
Very many and/or very long names were typed,
exceeding the limit of approximately 25K bytes.

Too many external symbols in one module
The limit is 256 external symbols per module.

Too many groups
The limit is 10 groups.

Too many libraries specified
The limit is 8 libraries.

Too many public symbols
The limit is 1024 public symbols.

Too many segments or classes
The limit is 256 (segments and classes taken
together).

Unresolved externals: <list>
The external symbols listed have no defining module
among the modules or library files specified.

VM read error
This is a disk error; it is not caused by MS-LINK.

Warning: no stack segment
None of the object modules specified contains a
statement allocating stack space, but you typed the
/STACK switch.

Warning: segment of absolute or unknown type
There is a bad object module or an attempt has been
made to link modules that MS-LINK cannot handle
(e.g., an absolute object module).

Write error in tmp file

No more disk space remains to expand the VM.TMP file.

Write error on run file

Usually, there is not enough disk space for the Run file.

APPENDIX A
INSTRUCTIONS FOR USERS WITH SINGLE-DRIVE SYSTEMS

NOTE

Information in this appendix
is installation-dependent and
may not be implemented on
every manufacturer's machine.

On a single-drive system, you enter the commands as you would on a multi-drive system.

You should think of the single-drive system as having two drives (drive A: and drive B:). But instead of A: and B: representing two physical drives as on the multi-drive system, the A: and B: represent disks.

If you specify drive B: when the "drive A: disk" was last used, you are prompted to insert the disk for drive B:. For example:

```
A> COPY COMMAND.COM B:
Insert diskette for drive B:
and strike any key when ready
  1 File(s) copied
A>_
```

If you specify drive A: when the "drive B: disk" was last used, you are prompted again to change disks. This time, MS-DOS prompts you to insert the "drive A: disk."

The same procedure is used if a command is executed from a batch file. MS-DOS waits for you to insert the appropriate disk and press any key before it continues. You will be prompted to do this.

NOTE

The letter displayed in the system prompt represents the default drive where MS-DOS looks to find a file whose name is entered without a drive specifier. The letter in the system prompt does not represent the last disk used.

For example, assume that A: is the default drive. If the last operation performed was DIR B:, MS-DOS believes the "drive B: disk" is still in the drive. However, the system prompt is still A:, because A: is still the default drive. If you type DIR, MS-DOS prompts you for the "drive A: disk" because drive A: is the default drive, and you did not specify another drive in the DIR command.

APPENDIX B

DISK ERRORS

If a disk or device error occurs at any time during a command or program, MS-DOS returns an error message in the following format:

```
<yyy> error <I/O action> drive <x>  
Abort,Ignore,Retry:_
```

In this message,<yyy> may be one of the following:

```
Write protect error  
Bad unit error  
Not ready error  
Bad command error  
Data error  
Bad call format error  
Seek error  
Non-DOS disk error  
Sector not found error  
No paper error  
Write fault error  
Read fault error  
Disk error
```

The <I/O-action> may be either of the following:

```
READING  
WRITING
```

The drive <x> indicates the drive in which the error has occurred.

MS-DOS waits for you to enter one of the following responses:

A Abort. Terminate the program requesting the disk read or write.

I Ignore. Ignore the bad sector and pretend the

error did not occur.

- R Retry. Repeat the operation. This response is to be used when the operator has corrected the error (such as with NOT READY or WRITE PROTECT errors).

Usually, you will want to attempt recovery by entering responses in this order:

- R (to try again)
A (to terminate program and try a new disk)

One other error message might be related to faulty disk read or write:

FILE ALLOCATION TABLE BAD FOR DRIVE x

This message means that the copy in memory of one of the allocation tables has pointers to nonexistent blocks. Possibly the disk was incorrectly formatted or not formatted before use. If this error persists, the disk is currently unusable and must be formatted prior to use.

APPENDIX C

ANSI ESCAPE SEQUENCES

NOTE

Information in this appendix is installation-dependent and may not be implemented on every manufacturer's machine.

An ANSI escape sequence is a series of characters (beginning with an escape character or keystroke) that you can use to define functions to MS-DOS. Specifically, you can reassign keys, change graphics functions, and affect cursor movement.

This appendix explains how the ANSI escape sequences are defined for MS-DOS version 2.0. Examples on how to use ANSI escape sequences are included at the end of this appendix.

Notes:

1. The default value is used when no explicit value or a value of zero is specified.
2. Pn represents "numeric parameter." This is a decimal number specified with ASCII digits.
3. Ps represents "selective parameter." This is any decimal number that is used to select a subfunction. Multiple subfunctions may be selected by separating the parameters with semicolons.

C.1 CURSOR FUNCTIONS

The following escape sequences affect the cursor position on the screen:

CUP - Cursor Postion

ESC [Pl ; Pc H

HVP - Horizontal & Vertical Postion

ESC [Pl ; Pc f

CUP and HVP move the cursor to the position specified by the parameters. The first parameter specifies the line number, and the second parameter specifies the column number. The default value is 1. When no parameters are specified, the cursor is moved to the home postion.

CUU - Cursor Up

ESC [Pn A

This sequence moves the cursor up one line without changing columns. The value of Pn determines the number of lines moved. The default value for Pn is 1. The CUU sequence is ignored if the cursor is already on the top line.

CUD - Cursor Down

ESC [Pn B

This sequence moves the cursor down one line without changing columns. The value of Pn determines the number of lines moved. The default value for Pn is 1. The CUD sequence is ignored if the cursor is already on the bottom line.

CUF - Cursor Forward

ESC [Pn C

The CUF sequence moves the cursor forward one column without changing lines. The value of Pn determines the number of columns moved. The default value for Pn is 1. The CUF sequence is ignored if the cursor is already in the far right column.

CUB - Cursor Backward

ESC [Pn D

This escape sequence moves the cursor back one column without changing lines. The value of Pn determines the number of columns moved. The default value for Pn is 1. The CUB sequence is ignored if the cursor is already in the far left column.

DSR - Device Status Report

ESC [6 n

The console driver will output a CPR sequence (see below) on receipt of the DSR escape sequence.

CPR - Cursor Position Report (from console driver to system)

ESC [Pn ; Pn R

The CPR sequence reports current cursor position via standard input. The first parameter specifies the current line and the second parameter specifies the current column.

SCP - Save Cursor Position

ESC [s

The current cursor position is saved. This cursor position can be restored with the RCP sequence (see below).

RCP - Restore Cursor Position

ESC [u

This sequence restores the cursor position to the value it had when the console driver received the SCP sequence.

C.2 ERASING

The following escape sequences affect erase functions:

ED - Erase Display

ESC [2 J

The ED sequence erases the screen, and the cursor goes to the home position.

EL - Erase Line

ESC [K

This sequence erases from the cursor to the end of the line (including the cursor position).

C.3 MODES OF OPERATION

The following escape sequences affect screen graphics:

SGR - Set Graphics Rendition

ESC [Ps ; ... ; Ps m

The SGR escape sequence invokes the graphic functions specified by the parameter(s) described below. The graphic functions remain until the next occurrence of an SGR escape sequence.

Parameter	Parameter Function
0	All Attributes off
1	Bold on
4	Underscore on (monochrome displays only)
5	Blink on
7	Reverse Video on
8	Concealed on (ISO 6429 standard)
30	Black foreground (ISO 6429 standard)
31	Red foreground (ISO 6429 standard)
32	Green foreground (ISO 6429 standard)
33	Yellow foreground (ISO 6429 standard)
34	Blue foreground (ISO 6429 standard)
35	Magenta foreground (ISO 6429 standard)
36	Cyan foreground (ISO 6429 standard)
37	White foreground (ISO 6429 standard)
40	Black background (ISO 6429 standard)
41	Red background (ISO 6429 standard)
42	Green background (ISO 6429 standard)
43	Yellow background (ISO 6429 standard)

44	Blue background	(ISO 6429 standard)
45	Magenta background	(ISO 6429 standard)
46	Cyan background	(ISO 6429 standard)
47	White background	(ISO 6429 standard)

SM - Set Mode

```
        ESC [ = Ps h
or      ESC [ = h
or      ESC [ = 0 h
or      ESC [ ? 7 h
```

The SM escape sequence changes the screen width or type to one of the following parameters:

Parameter	Parameter Function
0	40 x 25 black and white
1	40 x 25 color
2	80 x 25 black and white
3	80 x 25 color
4	320 x 200 color
5	320 x 200 black and white
6	640 x 200 black and white
7	wrap at end of line

RM - Reset Mode

```
        ESC [ = Ps l
or      ESC [ = l
or      ESC [ = 0 l
or      ESC [ ? 7 l
```

Parameters for RM are the same as for SM (Set Mode), except that parameter 7 will reset the wrap at the end of line mode.

C.4 KEYBOARD REASSIGNMENT

Although not part of the ANSI 3.64-1979 or ISO 6429 standard, the following keyboard reassignments are compatible with these standards.

The control sequence is:

```
ESC [ Pn ; Pn ; ... Pn p
or ESC [ "string" ; p
or ESC [ Pn ; "string" ; Pn ; Pn ; "string" ; Pn p
or any other combination of strings and decimal numbers
```

The final code in the control sequence (p) is one reserved for private use by the ANSI 3.64-1979 standard.

The first ASCII code in the control sequence defines which code is being mapped. The remaining numbers define the sequence of ASCII codes generated when this key is intercepted. Note that there is one exception: if the first code in the sequence is zero (NUL), then the first and second code make up an extended ASCII redefinition.

Examples:

1. Reassign the Q and q key to the A and a key (and vice versa):

ESC [6 5 ; 8 1 p	A becomes Q
ESC [9 7 ; 1 1 3 p	a becomes q
ESC [8 1 ; 6 5 p	Q becomes A
ESC [1 1 3 ; 9 7 p	q becomes a

2. Reassign the F10 key to to a DIR command followed by a carriage return:

```
ESC [ 0 ; 6 8 ; " d i r " ; 1 3 p
```

The 0;68 is the extended ASCII code for the F10 key; 13 decimal is a carriage return.

APPENDIX D

HOW TO CONFIGURE YOUR SYSTEM

In many cases, there are installation-specific settings for MS-DOS that need to be configured at system startup. An example of this is a standard device driver, such as an online printer.

The MS-DOS configuration file (CONFIG.SYS) allows you to configure your system with a minimum of effort. With this file, you can add device drivers to your system at startup. The configuration file is simply an ASCII file that has certain commands for MS-DOS startup (boot). The boot process is as follows:

1. The disk boot sector is read. This contains enough code to read MS-DOS code and the installation's BIOS (machine-dependent code).
2. The MS-DOS code and BIOS are read.
3. A variety of BIOS initializations are done.
4. A system initialization routine reads the configuration file (CONFIG.SYS), if it exists, to perform device installation and other user options. Its final task is to execute the command interpreter, which finishes the MS-DOS boot process.

D.1 CHANGING THE CONFIG.SYS FILE

If there is not a CONFIG.SYS file on the MS-DOS disk, you can use the MS-DOS editor, EDLIN, to create a file; then save it on the MS-DOS disk in your root directory.

The following is a list of commands for the configuration file CONFIG.SYS:

BUFFERS = <number>

This is the number of sector buffers that will comprise the system list. It is installation-dependent. If not set, 10 is a reasonable number.

FILES = <number>

This is the number of open files that the system calls 2FH through 57H can access. It is installation-dependent. If not set, 10 is a reasonable number.

DEVICE = <filename>

This installs the device driver in <filename> into the system list. (See below.)

BREAK = <ON or OFF>

If ON is specified (the default is OFF), a check for CONTROL-C as input will be made every time the system is called. ON improves the ability to abort programs over previous versions of the MS-DOS.

SHELL = <filename>

This begins execution of the shell (top-level command processor) from <filename>.

COUNTRY = <number>

This number is set by the equipment manufacturer to allow for international date, time, currency, and case conversion. Acceptable values are 1-99. This statement is only supported in versions of MS-DOS that are higher than 2.0.

A typical configuration file might look like this:

```
Buffers = 10
Files   = 10
Device  = \BIN\NETWORK.SYS
Break   = ON
Shell   = A:\BIN\COMMAND.COM A:\BIN /P
```

Note here that the Buffers and Files parameters are set to 10. The system initialization routine will search for the filename \BIN\NETWORK.SYS to find the device that is being added to the system. This file is usually supplied on disk with your device. Make sure that you save the device file in the pathname that you specify in the Device parameter.

This configuration file also sets the MS-DOS command EXEC to the COMMAND.COM file located on disk A: in the \BIN directory. The A:\BIN tells COMMAND.COM where to look for itself when it needs to re-read from disk. The /P tells COMMAND.COM that it is the first program running on the system so that it can process the MS-DOS EXIT command.

APPENDIX E

MS-DOS MESSAGE DIRECTORY

- [EDLIN] Abort edit (Y/N)?
 This message is displayed when you choose the Q (Quit) command in EDLIN. The Quit command exits the editing session without saving any editing changes. Specify Y (for Yes) or N (for No).
- [MS-DOS] Abort, Retry, Ignore?
 If a disk or device error occurs at any time during a command or program, MS-DOS returns this message and asks you to abort the command or program, retry it, or ignore the error.
- [PRINT] All files cancelled by operator
 This message is displayed when you specify the /T switch with the PRINT command.
- [CHKDSK] All specified files are contiguous
 All files are allocated contiguously on the disk without fragmentation.
- [CHKDSK] Allocation error in file, size adjusted
 An invalid sector number was found in the FAT. The file was truncated at the end of the last valid sector.
- [COMMAND] Are you sure (Y,N)?
 MS-DOS displays this message if you try to delete *.* (all files in the current directory). Specify Y (for Yes) or N (for No).
- [LINK] Attempt to access data outside of segment bounds, possibly bad object module
 There is probably a bad object file.
- [MS-DOS] Bad call format reading drive (x:)
 Device error. See Appendix B.

[MS-DOS] Bad call format writing drive (x:)
 Device error. See Appendix B.

[MS-DOS] Bad command error reading drive (x:)
 Device error. See Appendix B.

[MS-DOS] Bad command error writing drive (x:)
 Device error. See Appendix B.

[COMMAND] Bad command or file name
 The command cannot find the file you asked it
 to run. You either mistyped the filename or
 the file does not exist on the disk.

[FC] Bad file
 One of the files you specified is defective.

[LINK] Bad numeric parameter
 Numeric value is not in digits.

[MS-DOS] Bad or missing (filename)
 You specified an invalid device in the
 CONFIG.SYS file. Check the accuracy of the
 DEVICE statement in the CONFIG.SYS file.

[MS-DOS] Bad or missing Command Interpreter
 MS-DOS cannot find the COMMAND.COM file on
 the disk; either the file is missing from
 the root directory, or the file is invalid.
 Either restart the system or copy the
 COMMAND.COM file from your backup MS-DOS
 system disk onto the disk used to start
 MS-DOS. You will also receive this message
 if COMMAND.COM has been moved from the
 directory it was originally in when you
 started MS-DOS.

[MS-DOS] Bad unit error reading drive (x:)
 Device error. See Appendix B.

[MSDOS] Bad unit error writing drive (x:)
 Device error. See Appendix B.

[COMMAND] BREAK is off (or on)
 This message tells you the current setting of
 BREAK.

- [CHKDSK] Cannot CHDIR to (filename) - tree past this point not processed
CHKDSK is traveling the tree structure of the directory and is unable to proceed to the specified directory. All subdirectories underneath this directory will not be verified.
- [CHKDSK] Cannot CHDIR to root
Processing cannot continue
CHKDSK is traveling the tree structure of the directory and is unable to return to the root directory. CHKDSK is not able to continue checking the remaining subdirectories to the root.
- [COMMAND] Cannot do binary reads from a device
This message appears during COPY command processing. The COPY cannot be done in binary mode when you are copying from a device. Remove the /B switch or specify an ASCII copy with the /A switch.
- [EDLIN] Cannot edit .BAK file--rename file
You attempted to edit a backup copy created by EDLIN. Either rename the file or copy the .BAK file and give it a different extension.
- [PRINT] Cannot open (filename)
Either MS-DOS cannot find the specified file to print or the file does not exist. Check the command for a valid filename.
- [LINK] Cannot open temporary file
MS-LINK is unable to create the file VM.TMP because the disk directory is full. Insert a new disk. Do not remove the disk that will receive the List.MAP file.
- [CHKDSK] Cannot recover . entry, processing continued
The . entry (current directory) is defective.
- [CHKDSK] Cannot recover .. entry
The .. entry (parent directory) is defective.
- [CHKDSK] CHDIR .. failed, trying alternate method
In traveling the tree structure, CHKDSK was not able to return to a parent directory. It will try to return to that directory by starting over at the root and traveling down.

[COMMAND] Content of destination lost before copy
A file to be used as a source file to the COPY command has been overwritten prior to completion of the copy. Example:
COPY A + B B
which destroys B before it can be copied.

[CHKDSK] Convert lost chains to files (Y/N)?
If you respond Y to this prompt, CHKDSK will recover the lost blocks it found when checking the disk. CHKDSK will create a directory entry and a file for you with the filename FILEnnnn. If you respond N, CHKDSK frees the lost blocks so they can be reallocated.

[DISKCOPY] Copy another (Y/N)?
Respond Y if you wish to copy another disk.
Respond N if you do not wish to copy another disk.

[DISKCOPY] Copy complete
DISKCOPY has completed processing.

[DISKCOPY] Copy not completed
DISKCOPY could not copy the entire disk.

[DISKCOPY] Copying...
This message indicates that DISKCOPY is copying a disk.

[MS-DOS] Copyright 1981,82 Microsoft Corp.
This message appears on most MS-DOS utility and command banners.

[COMMAND] Current date is (mm-dd-yy)
This message is displayed in response to the DATE command.

[COMMAND] Current time is (hh:mm:ss.hh)
This message is displayed in response to the TIME command.

[MS-DOS] Data error reading drive (x:)
Device error. See Appendix B.

[MS-DOS] Data error reading drive (x:)
Device error. See Appendix B.

[FC] Data left in (filename)
After reaching the end of one of the files in a file comparison, the other file still has uncomparred data left.

- [CHKDSK] Directory is totally empty, no . or ..
The specified directory does not contain references to current and parent directories. Delete the specified directory and recreate it.
- [MS-DOS] Disk error reading drive (x:)
Device error. See Appendix B.
- [CHKDSK] Disk error reading FAT (x)
One of your File Allocation Tables has a defective sector in it. MS-DOS will automatically use the other FAT. It is a good idea to copy all your files onto another disk.
- [MS-DOS] Disk error writing drive (x:)
Device error. See Appendix B.
- [CHKDSK] Disk error writing FAT (x:)
One of your File Allocation Tables has a defective sector in it. MS-DOS will automatically use the other FAT. It is a good idea to copy all your files onto another disk.
- [EDLIN] Disk full--write not completed
You gave the End command, but the disk did not contain enough free space for the file. EDLIN aborted the E command and returned you to the operating system. Part of the file may have been written to disk and saved. Delete the saved portion and restart the editing session. The file will not be available after this error.
- [FORMAT] Disk unsuitable for system drive
FORMAT detected a bad track on the disk where system files should reside. You should only store data on the disk you tried to format when this message was displayed.
- [DISKCOPY] Disks must be the same size
You cannot copy the contents of a disk with a different format using DISKCOPY. Use the COPY command to copy files onto the disk.
- [MS-DOS] Divide overflow
The 8086 has set the divide overflow flag which is usually caused by division by zero.
- [CHKDSK] (.) (..) Does not exist
This is an informational message from CHKDSK. This message indicates either the . or .. directory entry is invalid.

[COMMAND] Duplicate file name or File not found
You have tried to rename a file to a filename that already exists or the name you specified could not be found.

[COMMAND] ECHO is off (or on)
This message tells you the current status of ECHO.

[EDLIN] End of input file
The entire file was read into memory. If the file is read in sections, this message indicates the last section of the file is in memory.

[COMMAND] Enter new date:
You must respond to this prompt when you start MS-DOS. Enter the date in a <mm>/<dd>/<yy> format.

[COMMAND] Enter new time:
You must respond to this prompt when you start MS-DOS. Enter the time in the <hh>:<mm>:<ss> format.

[EDLIN] Entry error
The last command you typed contained a syntax error. Retype the command with the correct syntax and press <RETURN>.

[CHKDSK] Entry has a bad attribute (or link or size)
This message may be preceded by one or two periods which indicate which subdirectory is invalid. If you have specified the /F switch, CHKDSK will attempt to correct the error.

[LINK] Error: duplicate record too complex
A DUP record in an assembly language module is too complex. Simplify the DUP record in your assembly language program.

[LINK] Error: fixup offset exceeds field width
An assembly language instruction refers to an address with a short instruction instead of a long instruction. Edit your assembly language source and reassemble.

- [COMMAND] Error in .EXE file
The .EXE file you have asked MS-DOS to load has an invalid internal format.
- [PRINT] (type of error) error reading file
Device error. See Appendix B.
- [COMMAND] Error writing to device
You tried to send too much data to a device. MS-DOS was unable to write the data to the specified device.
- [CHKDSK] Errors found, F parameter not specified
Corrections will not be written to disk
CHKDSK found errors on the disk. If you have not specified the /F switch, CHKDSK will continue printing messages but will not correct the errors.
- [PRINT] Errors on list device indicate that it may be off-line. Please check it
Your printer is offline.
- [COMMAND] EXEC failure
MS-DOS either found an error when reading a command or the FILES statement in the CONFIG.SYS file is set too low. Increase the value and restart MS-DOS.
- [COMMAND] File allocation table bad
The disk may be defective. Run CHKDSK to check the disk.
- [PRINT] File allocation table bad drive (x:) [CHKDSK]
The disk may be defective. Run CHKDSK to check the disk.
- [COMMAND] File cannot be copied onto itself
The source filename you specified is the same as the destination filename. Example:
COPY A A.

[EXE2BIN] File cannot be converted
The input file is not in the correct format.

[COMMAND] File creation error
You tried to add a new filename or replace a file that already exists in the directory. If the file already exists, it is a read-only file and cannot be replaced. Run CHKDSK on the disk to determine the cause of the error.

[CHKDSK] (filename) contains non-contiguous blocks
The filename specified is not allocated contiguously on the disk. If you specify the /F switch, CHKDSK will fix this error.

[PRINT] (filename) file not found
You switched disks while a file was queued up, but before it started to print. Reissue the PRINT command for that filename.

[CHKDSK] (filename) is cross linked on cluster
Make a copy of the file you want to keep, and then delete both files that are cross linked.

[PRINT] (filename) is currently being printed
The filename specified is being printed.

[PRINT] (filename) is in queue
The filename specified is waiting to be printed.

[EDLIN] File name must be specified
You did not specify a filename when you started EDLIN.

[COMMAND] File not found [EDLIN, FC, FIND, RECOVER]
MS-DOS cannot find the file that you specified. Check to see that the pathname is accurate and that the file exists in the directory you specified.

[FC] Files are different
FC compares what can be loaded into the buffer space. If no lines match in the portion of the files in the buffer space, FC will display this message.

- [CHKDSK] First cluster number is invalid, entry truncated
The file directory entry contains an invalid pointer to the data area. If you specified the /F switch, the file is truncated to a zero-length file.
- [EXE2BIN] Fixups needed - base segment (hex:)
The source (.EXE) file contained information indicating that a load segment is required for the file. Specify the absolute segment address at which the finished module is to be located.
- [COMMAND] FOR cannot be nested
Nesting of FOR statements is not allowed in a batch file.
- [FORMAT] Format another (Y/N)?
Type Y (for Yes) to format another disk. Type N (for No) if you do not want to format another disk. If you accidentally type Y, you can abort the format process by typing <CONTROL-C> in response to the "Strike any key to begin formatting" message.
- [FORMAT] Format failure
MS-DOS could not format the disk. This message is always displayed in conjunction with an explanation as to why MS-DOS could not format the disk.
- [SYS] Incompatible system size
The system files IO.SYS and MSDOS.SYS occupy more space on the source disk than is available on the destination disk.
- [CHKDSK] Incorrect DOS version [EDLIN, FC, FIND, FORMAT, MORE, PRINT, RECOVER, SORT, SYS]
Many version 2.00 utilities will not run on older versions of MS-DOS. The utilities CHKDSK, PRINT, and SYS will only run under the exact version of MS-DOS for which they were configured.
- [LINK] Input file read error
There is probably a defective object file.

- [MS-DOS] Insert diskette for drive (x:) and strike any key when ready
This message appears when MS-DOS is copying and formatting. You should insert a disk in the appropriate drive and press any alphanumeric key to begin processing.
- [COMMAND] Insert diskette with batch file and press any key when ready
You no longer have the disk containing the batch file you specified in the drive you originally specified. Reinsert the disk that contains the batch file in the appropriate drive.
- [FORMAT] Insert DOS diskette in drive (x:) and strike any key when ready
You have specified FORMAT /S but the disk in the default drive does not contain MS-DOS system files. Insert a disk with the files IO.SYS and MSDOS.SYS (bootable disk) in the drive specified.
- [DISKCOPY] Insert formatted target diskette into drive (x:)
DISKCOPY is ready for a disk in the destination drive. DISKCOPY requires that the destination disk be already formatted.
- [FORMAT] Insert new diskette for drive (x:) and strike any key when ready
Insert a blank disk into the appropriate drive and press any alphanumeric key to begin formatting. If there is any data on the disk, it will be destroyed by the format process.
- [DISKCOPY] Insert source diskette into drive (x:)
Insert the disk to be copied into the specified drive.
- [SYS] Insert system diskette in drive (x:) and strike any key when ready
SYS needs a bootable disk from which to read the IO.SYS and MSDOS.SYS files. Insert a bootable disk into the specified drive and press any alphanumeric key to start the system copy process.
- [DISKCOPY] Insert target diskette into drive (x:)
You are running DISKCOPY and your source and destination drives are the same. Reinsert the destination disk into the specified drive.

- [COMMAND] Insufficient disk space [SORT]
The disk is full. It does not contain enough room to perform the specified operation.
- [CHKDSK] Insufficient memory [EDLIN, SORT]
There is not enough memory to perform the specified operation.
- [FORMAT] Insufficient memory for system transfer
Your memory configuration is insufficient to transfer the MS-DOS system files IO.SYS and MSDOS.SYS (the /S switch).
- [CHKDSK] Insufficient room in root directory. Erase files in root and repeat CHKDSK
CHKDSK always recovers lost files into the root directory. In this case, your root directory is full. Delete some files in your root directory to make room for the lost files.
- [COMMAND] Intermediate file error during pipe
The pipe operation makes use of temporary files on the disk which will automatically be deleted after the piping process is complete. An error has occurred in one of these files.
- [FC] Internal error
This message indicates an internal logic error in the FC utility.
- [FORMAT] Invalid characters in volume label
The volume label should contain only up to 11 alphanumeric characters.
- [COMMAND] Invalid COMMAND.COM Insert COMMAND.COM disk in default drive and strike any key when ready
The application you have just run used up almost all of memory. It is necessary for MSDOS to reload the COMMAND.COM file from disk. However, MSDOS cannot find COMMAND.COM on the disk or the copy found is invalid. Insert a disk into the default drive which contains a copy of COMMAND.COM similar to the version on the disk with which you started MS-DOS.

- [COMMAND] Invalid COMMAND.COM Insert COMMAND.COM disk in drive (x:) and strike any key when ready
The application you have just run used up almost all of memory. It is necessary for MSDOS to reload the COMMAND.COM file from disk. However, MSDOS cannot find COMMAND.COM on the disk or the copy found is invalid. Insert a disk into the specified drive which contains a copy of COMMAND.COM similar to the version on the disk with which you started MS-DOS.
- [MS-DOS] Invalid country code
You have specified a country number in your CONFIG.SYS file which is not in the table of files configured in this implementation of MS-DOS. Country codes must be in the range 1-99. Consult the documentation on CONFIG.SYS for more information on supported countries.
- [CHKDSK] Invalid current directory
Your disk is bad. Replace the disk or make another copy from your backup system disk.
- [COMMAND] Invalid date
You specified an invalid date in response to the date prompt when starting MS-DOS.
- [COMMAND] Invalid device
The device specified was not CON, NUL, AUX, or PRN.
- [COMMAND] Invalid directory
The directory you specified either does not exist or is invalid. Check to see that you entered the directory name correctly.
- [COMMAND] Invalid drive in search path
The drive does not exist.
- [EDLIN] Invalid drive or file name [RECOVER]
Specify a valid drive or a valid file name.
- [CHKDSK] Invalid drive specification [COMMAND, DISKCOPY, FORMAT, SYS]
Specify a valid drive.
- [COMMAND] Invalid number of parameters [FC, FIND, RECOVER]
You have specified the wrong number of options in the command line.

- [LINK] Invalid object module
An object module(s) is incorrectly formed or incomplete (as when assembly is stopped in the middle).
- [CHKDSK] Invalid parameter [COMMAND, EDLIN, FC, FIND, FORMAT, PRINT]
One of the switches that you have specified is wrong.
- [COMMAND] Invalid path or file name
Specify a valid pathname or filename to the COPY command.
- [COMMAND] Invalid path, not directory, or directory not empty
You are unable to remove the directory requested for one of the specified reasons.
- [CHKSK] Invalid sub-directory entry
The subdirectory that you specified either does not exist or is invalid. Check to see that you entered the subdirectory name correctly.
- [COMMAND] Invalid time
You specified an invalid time in response to the time prompt when starting MS-DOS.
- [COMMAND] Label not found
There is a GOTO command to a nonexistent label in a batch file.
- [EDLIN] Line too long
During a Replace command, the string given as the replacement caused the line to expand beyond 253 characters. Divide the long line into two lines and retry the Replace command.
- [PRINT] List output is not assigned to a device
When you first run print, it asks you what device you want to specify as a print spooler. This message appears if PRINT is set up for a nonexistent device.
- [COMMAND] Memory allocation error. Cannot load COMMAND, system halted
Restart MS-DOS. If this error persists, make a new copy of the MS-DOS disk from your backup copy of the system disk.

- [MORE] --More--
 Press the space bar to view more of the file
 or directory.
- [EDLIN] Must specify destination line number
 You must specify a destination line number
 when you are copying and inserting lines with
 EDLIN.
- [COMMAND] Must specify ON or OFF
 The command requires either an ON or an OFF
 argument.
- [PRINT] Name of list device [PRN]:
 This prompt appears when PRINT is run the
 first time. Any valid device may be
 specified and that device then becomes the
 PRINT output device.
- [EDLIN] New file
 This message is printed if EDLIN does not
 find a file with the name you specified. If
 you are creating a new file, ignore this
 message. If you do not intend to create a
 new file, check to see that you correctly
 typed the filename of the file you wish to
 edit.
- [PRINT] No files match d:xxxxxxx.xxx
 A filespec was given for files to add to the
 queue, but no files match the specification.
- [COMMAND] No free file handles Cannot start COMMAND.COM,
 exiting
 Restart MS-DOS. If this message persists,
 increase the FILES parameter in the
 CONFIG.SYS file.
- [MS-DOS] No paper error writing device (dev)
 Device error. See Appendix B.
- [COMMAND] No path
 You have typed PATH<RETURN> to find out what
 your search path is. There is no current
 command search path.
- [SYS] No room for system on destination disk
 There is not enough room for the system files
 on the destination disk. Delete some files
 to make room for the system files or use
 another disk. You may need to reformat the
 disk to put the system on it.
- [EDLIN] No room in directory for file
 You have tried to save a file to the root

directory but it is full. Subdirectories are not limited in size as is the root directory.

- [MS-DOS] Non-DOS disk error reading drive (x)
Device error. See Appendix B.
- [EDLIN] Not enough room to merge the entire file
There was not enough room in memory to hold the file during a Transfer command. You must free some memory by writing some files to disk or deleting some files before you can transfer this file.
- [EDLIN] Not found
You have specified a Search or a Replace command that was unable to find a further occurrence of the specified Search or Replace string.
- [MS-DOS] Not ready error reading drive (x:)
Device error. See Appendix B.
- [MS-DOS] Not ready error writing drive (x:)
Device error. See Appendix B.
- [EDLIN] O.K.?
This prompt occurs during Search and Replace command processing. If you press any key except Y or <RETURN>, the search or replace continues.
- [COMMAND] Out of environment space
There is not enough room in the program environment to accept more data.
- [FORMAT] Press any key to begin formatting (x:)
This prompt is issued before you format a disk. Press any alphanumeric key to begin the format process. If you wish to discontinue this operation, press <CONTROL-C>.
- [RECOVER] Press any key to begin recovery of the (xxx) file(s) on drive (x:)
This prompt is issued before you recover a disk or file. Press any alphanumeric key to begin the recover process. If you wish to discontinue this operation, press <CONTROL-C>.

[DISKCOPY] Press any key when ready
This prompt occurs when you are copying disks. When you have inserted the disks into the appropriate drives, press any alphanumeric key to begin the DISKCOPY process. If you wish to discontinue this operation, press <CONTROL-C>.

[PRINT] PRINT queue is empty
There are no files waiting to be printed.

[PRINT] PRINT queue is full
There is room for 10 files in the list of files waiting to be printed.

[CHKDSK] Probable non-DOS disk Continue (Y/N)?
The disk you are using is not recognized by this version of MS-DOS. The disk either was created by another system with a format that is not supported on this version of MS-DOS or is not an MS-DOS disk. Do not continue processing if CHKDSK has returned this message for a removable disk. If this message is returned for a hard disk, the information describing the characteristics of the disk to MS-DOS has been destroyed. In this case, you may continue CHKDSK processing.

[CHKDSK] Processing cannot continue
There is not enough memory in your machine to process CHKDSK for this disk. You must obtain more memory to run CHKDSK.

[LINK] Program size or number of segments exceeds capacity of linker
The total size may not exceed 384K bytes and the number of segments may not exceed 255.

[COMMAND] Program too big to fit in memory
You must acquire more memory to run your application. It is possible that some applications you have run are still using some memory. You may try to restart MS-DOS; however, if you still receive this message, you must acquire more memory.

[FC] Read error in (filename) [FIND]
MS-DOS could not read the file.

[MS-DOS] Read fault error reading drive (x):
Device error. See Appendix B.

- [LINK] Requested stack size exceeds 64K
Specify a size greater than or equal to 64K bytes with the /STACK switch.
- [PRINT] Resident part of PRINT installed
This is the first message that MS-DOS displays when you issue the print command. It means that available memory has been reduced by several thousand bytes to process the PRINT command concurrent with other processes.
- [MS-DOS] Sector not found error reading drive (x:)
Device error. See Appendix B.
- [MS-DOS] Sector not found error writing drive (x:)
Device error. See Appendix B.
- [MS-DOS] Sector size too large in file (filename)
The specified device driver loaded by CONFIG.SYS uses a sector size larger than that of any other device driver on the system. You cannot run this device driver.
- [MS-DOS] Seek error reading drive (x:)
Device error. See Appendix B.
- [MS-DOS] Seek error writing drive (x:)
Device error. See Appendix B.
- [LINK] Segment size exceeds 64K
64K bytes is the addressing system limit.
- [DISKCOPY] Source and target diskettes are not the same format. Cannot do the copy
You must have the same size and kind of disks to run DISKCOPY. Example: you cannot copy from a single-sided disk to a double-sided disk. Reformat the target disk to be of the same type as the source disk.
- [MS-DOS] Specified COMMAND search directory bad
The SHELL statement in the CONFIG.SYS file is incorrect. The place that you have told MS-DOS to find COMMAND.COM does not exist, or COMMAND.COM is not in that place.

- [COMMAND] Strike a key when ready...
This prompt occurs during command processing and is always accompanied by another message. This message is also displayed if you have inserted a PAUSE statement in a batch file. Usually, you are asked to insert disks into appropriate drives before this prompt. Press any alphanumeric key to begin command processing.
- [LINK] Symbol defined more than once
MS-LINK found two or more modules that define a single symbol name.
- [LINK] Symbol table capacity exceeded
Very many and/or very long names were typed, exceeding the limit of approximately 25K bytes.
- [COMMAND] Syntax error [FIND]
Check to make sure that you have typed the command correctly.
- [FORMAT] System transferred [SYS]
The system files MSDOS.SYS and IO.SYS have been transferred during FORMAT or SYS command processing.
- [COMMAND] Terminate batch job (Y/N)?
If you press <CONTROL-C> while in batch mode, MS-DOS asks you whether or not you wish to end batch processing. Press Y to end processing. Press N to continue the batch job.
- [LINK] Too many external symbols in one module
The limit is 256 external symbols per module.
- [LINK] Too many groups
The limit is 10 groups.
- [LINK] Too many libraries specified
The limit is 8 libraries.
- [LINK] Too many public symbols
The limit is 1024 public symbols.
- [LINK] Too many segments or classes
The limit is 256 (segments and classes taken together).

- [FORMAT] Track 0 bad - disk unusable
 FORMAT can accommodate for defective sectors on the disk except for those near the beginning. In this case, use another disk.
- [COMMAND] Unable to create a directory
 MS-DOS could not create the directory you specified. Check to see that there is not a name conflict (you may have a file by the same name) or the disk may be full.
- [MS-DOS] Unrecognized command in CONFIG.SYS
 There is an invalid statement in your CONFIG.SYS file. Refer to Appendix D for a list of valid statements.
- [CHKDSK] Unrecoverable error in directory Convert directory to file (Y/N)?
 If you respond Y to this prompt, CHKDSK will convert the bad directory into a file. You can then fix the directory yourself or delete it.
- [LINK] Unresolved externals: <list>
 The external symbols listed have no defining module among the modules or library files specified.
- [COMMAND] VERIFY is off (or on)
 This message tells you the current setting of VERIFY.
- [LINK] VM read error
 This is a disk error; it is not caused by MS-LINK.
- [COMMAND] Volume in drive (x:) has no label
 This is an informational message displayed in response to the DIR command.
- [COMMAND] Volume in drive (x:) is (filename)
 This is an informational message displayed in response to the DIR command.

- [FORMAT] Volume label (11 characters, ENTER for none)?
This message is displayed when you specify the /V switch in the FORMAT command. Specify a volume label or press <RETURN> to indicate that you do not want a volume label for this disk.
- [RECOVER] Warning - directory full
The root directory is too full for RECOVER processing. Delete some files in the root directory to free space.
- [EXE2BIN] Warning: Read error in EXE file

The amount read was less than the size of the header. This is a warning message only.
- [LINK] Warning: no stack segment
None of the object modules specified contains a statement allocating stack space, but you typed the /STACK switch.
- [LINK] Warning: segment of absolute or unknown type
There is a bad object module or an attempt has been made to link modules that MS-LINK cannot handle (e.g., an absolute object module).
- [LINK] Write error in TMP file
No more disk space remains to expand the VM.TMP file.
- [LINK] Write error on run file
Usually, there is not enough disk space for the Run file.
- [MS-DOS] Write fault error writing drive (x:)
Device error. See Appendix B.
- [MS-DOS] Write protect error writing drive (x:)
Device error. See Appendix B.
- [RECOVER] (xxxx) of (xxxx) bytes recovered
This message tells you how many bytes MS-DOS was able to recover of the disk or file.
- [PRINT] (filename) cancelled by operator
This message is printed on the printer when you specify the /T switch in the PRINT command.

The following messages are displayed when certain MS-DOS commands have completed processing. These are informational messages only.

[CHKDSK] (xxxx) bytes available on disk [FORMAT]
[CHKDSK] (xxxx) bytes disk space freed
[CHKDSK] (xxxx) bytes disk space would be freed
[CHKDSK] (xxxx) bytes free [COMMAND]
[CHKDSK] (xxxx) bytes in (yyyy) directories
[CHKDSK] (xxxx) bytes in (yyyy) hidden files
[CHKDSK] (xxxx) bytes in (yyyy) recovered files
[CHKDSK] (xxxx) bytes in (yyyy) user files
[CHKDSK] (xxxx) bytes in bad sectors [FORMAT]
[CHKDSK] (xxxx) bytes total disk space [FORMAT]
[CHKDSK] (xxxx) bytes total memory
[FORMAT] (xxxx) bytes used by system
[CHKDSK] (xxxx) bytes would be in (yyyy) recovered files
[COMMAND] (xxxx) file(s)
[COMMAND] (xxxx) file(s) copied
[RECOVER] (xxxx) file(s) recovered
[CHKDSK] (xxxx) lost clusters found in (xxxx) chains
[CHKDSK] (filename) contains (xxxx) non-contiguous blocks*
[CHKDSK] (filename) has invalid cluster, file truncated
[CHKDSK] Volume (filename) created (mmm dd, yyyy)

INDEX

+ (command character) (MS-LINK) 9-14
 ; (command character) (MS-LINK) 9-15

 Abort B-1
 Adding lines, (EDLIN) 7-22
 Addresses (MS-LINK) 9-6
 ANSI escape sequences C-1
 cursor functions C-2
 erasing C-3
 modes of operation C-4
 Arguments 4-4
 Asterisk (*) 3-3 to 3-4
 AUTOEXEC.BAT file 2-8, 4-8, 4-11, 5-20
 Automatic Program Execution . 2-8, 4-8

 BACKUP command 5-5
 Backup disks 2-6, 3-7
 BASIC 4-11
 .BAT extension 4-6
 .BAT file
 executing 4-13
 Batch processing 4-6
 Batch processing commands . . 5-58
 Binary files (FC) 8-2
 BIOS initializations D-1
 Brackets 3-3
 BREAK (CONFIG.SYS file) . . . D-2
 BREAK command 5-7
 Buffer space (FC) 8-2
 BUFFERS (CONFIG.SYS file) . . D-2

 Changing directories 3-14
 CHDIR command 3-13 to 3-14, 5-8
 Checking disks 2-11
 CHKDSK command 2-11
 CHKDSK errors 5-9
 Class (MS-LINK) 9-16
 Class name (MS-LINK) 9-6
 Classes (MS-LINK) 9-5
 Clearing the screen 5-14
 CLS command 5-14
 Command characters
 + (MS-LINK) 9-14
 ; (MS-LINK) 9-15
 Command formats 5-2
 Command options 4-3
 Command options (EDLIN) . . . 7-20
 Command processor 2-2, 2-4, 3-12, 4-2

Command prompts

Libraries (MS-LINK) . . .	9-10, 9-18
List File (MS-LINK) . . .	9-10, 9-17
Object Modules (MS-LINK) . . .	9-10, 9-16
Run File (MS-LINK) . . .	9-10, 9-17
summary (MS-LINK) . . .	9-10
COMMAND.COM	2-2
Commands	4-2
BACKUP	5-5
BREAK	5-7
CD	3-14
CHDIR	5-8
CHKDSK	2-11, 5-9
CLS	5-14
COPY	3-5, 5-15
CTTY	5-19
DATE	5-20
DEL	5-22
DIR	2-9, 3-13, 5-23
DISKCOPY	2-6, 5-24
ECHO	5-58
EXE2BIN	5-27
EXIT	5-30
External	4-2
FIND	4-14, 5-31
FOR	5-59
FORMAT	2-4, 2-9, 5-33
GOTO	5-60
IF	5-61
Internal	4-2
MKDIR	3-13, 5-35
MORE	4-14, 5-36
PATH	5-37
PAUSE	4-6, 5-62
PRINT	5-38
PROMPT	5-41
RECOVER	5-43
REM	4-6, 5-44
REN	5-45
RESTORE	5-46
RMDIR	3-14, 5-47
SET	5-48
SHIFT	4-12, 5-63
SORT	4-14, 5-49
SYS	5-51
TYPE	5-54
VER	5-55
VERIFY	5-56
VOL	5-57
Comparing files	8-2
Compiler	9-2
Concatenation	5-16

CONFIG.SYS file	
changing	D-1
Configuration file	D-2
Configuring your system	D-1
Control character functions . .	6-6 to 6-7
<CONTROL-C>	4-5, 4-8
CONTROL-C check	5-7
<CONTROL-H>	6-7
<CONTROL-J>	6-7
<CONTROL-N>	6-7
<CONTROL-P>	6-7
<CONTROL-S>	4-5, 6-7
<CONTROL-X>	6-7
<CONTROL-Z>	4-11 to 4-12, 6-4
COPY command	3-5
<COPY1>	6-4, 7-5 to 7-6
<COPYALL>	6-4, 7-5, 7-8
Copying disks	2-6, 5-24
Copying files	5-15
Copying lines, (EDLIN)	7-23
<COPYUP>	6-4, 7-5, 7-7
CTTY command	5-19
Current date	2-2
Current time	2-3
Cursor Backward sequence . . .	C-3
Cursor Down sequence	C-2
Cursor Forward sequence	C-2
Cursor functions	C-2
Cursor movement	C-1
Cursor Position Report sequence	C-3
Cursor Up sequence	C-2
Data Error	B-1
Data protection	2-6
Date	2-2
Default drive	2-4, 8-3
Deleting directories	5-47
Deleting files	5-22
Deleting lines (EDLIN)	7-25
Delimiters	4-4
DEVICE (CONFIG.SYS file) . . .	D-2
Device errors	B-1
Device names	3-5
Device Status Report sequence	C-3
Difference reporting (FC) . . .	8-5
DIR command	2-9, 3-13

Directories	
changing	3-14, 5-8
creating	3-13
definition	2-9, 3-7
displaying	2-9, 5-23
hierarchical	3-7, 3-10
making	5-35
removing	3-14, 5-47
root	2-9
working	2-9, 3-8, 3-13
Disk Errors	
Abort	B-1
Data Error	B-1
Disk Error	B-1
File Allocation Table Bad For Drive x	B-2
Ignore	B-1
Not Ready Error	B-1
Retry	B-2
Sector Not Found Error	B-1
Seek Error	B-1
Write Fault Error	B-1
Write Protect Error	B-1
DISKCOPY command	2-6, 5-24
Disks	
backing up	2-6, 5-5
checking	2-11, 5-9
copying	2-6, 5-24
formatting	2-4, 5-33
Displaying directories	5-23
Displaying files	5-54
Drive designation	3-2, 4-3
Drive designation (FC)	8-3
Drive designation (MS-LINK)	9-7
Dummy parameters	4-12
ECHO command	
ECHO command	5-58
Editing and function keys	4-5
Editing commands	
Copy characters	7-6
Copy template	7-8
Enter insert mode	7-12
Exit insert mode	7-14
New template	7-15
Quit	7-11
Quit input	7-11
Replace mode	7-14
Skip multiple characters	7-10
Skip one character	7-9
Editing files	7-2
Editing keys	6-2, 7-3
Editing text (EDLIN)	7-27
EDLIN	4-6, 7-2
starting	7-2

EDLIN commands	
Append Lines	7-22
Copy Lines	7-23
Delete Lines	7-25
Edit Line	7-27
End Editing	7-29
Insert Text	7-30
List Text	7-33
Page	7-37
Quit	7-38
Replace Text	7-39
Search Text	7-42
Transfer Text	7-45
Write Lines	7-46
Ellipsis	5-2
Ending the edit session, (EDLIN)	7-29
Erase Display sequence	C-4
Erase Line sequence	C-4
Erasing the screen	C-3
Error messages (FC)	8-10
Error messages (EDLIN)	7-47
Error messages, MS-DOS	E-1
.EXE (MS-LINK)	9-7, 9-17
.EXE file (MS-LINK)	9-2
EXE2BIN command	5-27
EXE2BIN errors	5-28
Executable files	
converting	5-27
definition	4-3
Executing a .BAT file	4-13
EXIT command	5-30
External commands	3-11, 4-2 to 4-3
External reference (MS-LINK)	9-2
FC	8-2
FC switches	8-3
File Allocation Table	2-9
File Allocation Table Bad For Drive x	B-2
File specification	3-3, 8-2
File system	3-8
Filename extension	4-3
Filename extensions	
.COM	4-3
.EXE	4-3
Filename extensions - default	
.EXE (MS-LINK)	9-7
.MAP (MS-LINK)	9-7
.OBJ (MS-LINK)	9-7

Filenames	
as part of commands	4-3
definition	3-2
extension	3-2
illegal	3-5
parts	3-2
Files	
binary (FC)	8-2
comparing	8-2
concatenating	5-16
copying	3-5, 5-15
definition	2-9
deleting	5-22
displaying	5-54
editing	7-2
naming	3-2
printing	5-38
protecting	3-7
recovering	5-43
renaming	5-45
restoring	5-46
sorting	5-49
source (FC)	8-2
FILES (CONFIG.SYS file)	D-2
Files that MS-LINK uses	9-7
Filespec	4-4
Filters	4-14
definition	4-14
FIND	4-14
MORE	4-14
SORT	4-14
FIND command	4-14, 5-31
FIND errors	5-32
FOR command	5-59
FORMAT command	2-4, 2-9
Formatting disks	2-4, 5-33
GOTO command	5-60
Graphic functions, changing	C-1
Groups (MS-LINK)	9-5
Hidden files	2-10
Hierarchical directory	3-7, 3-9
IF command	5-61
Ignore	B-1
Illegal filenames	3-5
Input	4-13
Input redirection	4-14
<INSERT>	6-4, 7-5, 7-12
Inserting text (EDLIN)	7-30
Internal commands	3-12, 4-2

Joining files	5-16
Keyboard reassignment	C-6
Keys, reassigning	C-1
Keywords	5-2
.LIB (MS-LINK)	9-7
LINK (FC)	8-2
Listing lines (EDLIN)	7-33
Loading MS-DOS	2-2
Logoff	2-11
Making directories	5-35
.MAP (MS-LINK)	9-7, 9-17
Merging files (EDLIN)	7-45
Message directory	E-1
MKDIR command	3-13, 5-35
Modes of operation	C-4
MORE command	4-14, 5-36
Moving lines, (EDLIN)	7-36
MS-DOS commands	5-2
MS-DOS files	1-4
MS-DOS prompt	2-4
Multiplan	4-8
<NEWLINE>	6-4, 7-5, 7-15
Not Ready Error	B-1
/O (FORMAT)	5-33
.OBJ (MS-LINK)	9-7, 9-16
Object modules	9-2
Operating system	1-2
Output	4-13
Output redirection	4-14
Output redirection (FC)	8-6
Paging through files (EDLIN)	7-37
Parameters	
definition	4-12
replaceable	4-12
Parent directory	
CHDIR command	5-8
shorthand notation	3-11
PATH command	3-11, 5-37
Pathing	3-10
Pathnames	
definition	3-10
syntax	3-10, 4-4
used with CHDIR command	3-14
PAUSE command	4-6
Piping	4-13, 4-15
PRINT errors	5-39
PRINT command	5-38

PROMPT command	5-41
Protecting files	3-7
Question mark (?)	3-3
Quitting the edit session (EDLIN)	7-38
RECOVER command	5-43
Recovering files	5-43
Redirecting output	4-14
Redirecting output (FC)	8-6
Relative address (FC)	8-3
Relocatable load module (MS-LINK)	9-2
REM command	4-6
Removing directories	3-14, 5-47
RENAME (synonym for REN)	5-45
Renaming files	5-45
<REPLACE>	7-5, 7-14
Replaceable parameters	4-12
Replacing text (EDLIN)	7-39
Reserved filenames	
AUX	3-5
CON	3-5
NUL	3-5
PRN	3-5
Reset Mode sequence	C-5
Response file (MS-LINK)	9-12
RESTORE command	5-46
Restore Cursor Position sequence	C-3
Restoring files	5-46
Retry	B-2
RMDIR command	3-14, 5-47
Root directory	2-9, 3-9, D-1
/S (FORMAT)	5-33
Save Cursor Position sequence	C-3
Screen	
changing	C-1
erasing	C-3
graphics	C-4
Searching for text (EDLIN)	7-42
Sector Not Found Error	B-1
Seek Error	B-1
Segment name (MS-LINK)	9-6
Segments (MS-LINK)	9-5, 9-16
Separators	2-2
SET command	5-48
Set Graphics Rendition sequence	C-4
Set Mode sequence	C-5
SHELL (CONFIG.SYS file)	D-2
SHIFT command	4-12, 5-63
Shorthand notation	3-11
Single-drive systems	A-1

<SKIPl>	6-4, 7-5, 7-9
<SKIPUP>	6-4, 7-5, 7-10
SORT command	4-14, 5-49
Sorting files	5-49
Source code	9-2
Source drives	4-5
Source files (FC)	8-2
Special characters	3-2
Special editing keys	7-3
Starting	
EDLIN	7-2
FC	8-3
MS-DOS	2-2
MS-LINK	9-9
Subdirectory	3-13
Switches	4-4
FC	
/#	8-4
/B	8-3
/C	8-4
/W	8-4
MS-LINK	
/DSALLOCATE	9-19
/HIGH	9-20
/LINENUMBERS	9-20
/MAP	9-20
/NO	9-22
/PAUSE	9-21
/STACK	9-21
Syntax notation	1-4
Syntax of pathnames	3-10
SYS command	5-51
SYS errors	5-51
Target drives	4-5
Time	2-2
Transferring system files	5-51
/V (FORMAT)	5-33
VER command	5-55
VERIFY command	5-56
Version number, displaying	5-55
VM.TMP file (MS-LINK)	9-8
<VOID>	6-4, 7-5, 7-11
VOL command	5-57
Volume ID	3-13
Volume label	
definition	2-5
displaying	5-57

Wild cards	3-3, 4-5
the * wild card	3-4
the ? wild card	3-3
Working directory	
creating files	3-8
definition	2-9
displaying	3-13, 5-8
shorthand notation	3-11
Write Fault Error	B-1
Write Protect Error	B-1
Writing to disk (EDLIN)	7-46